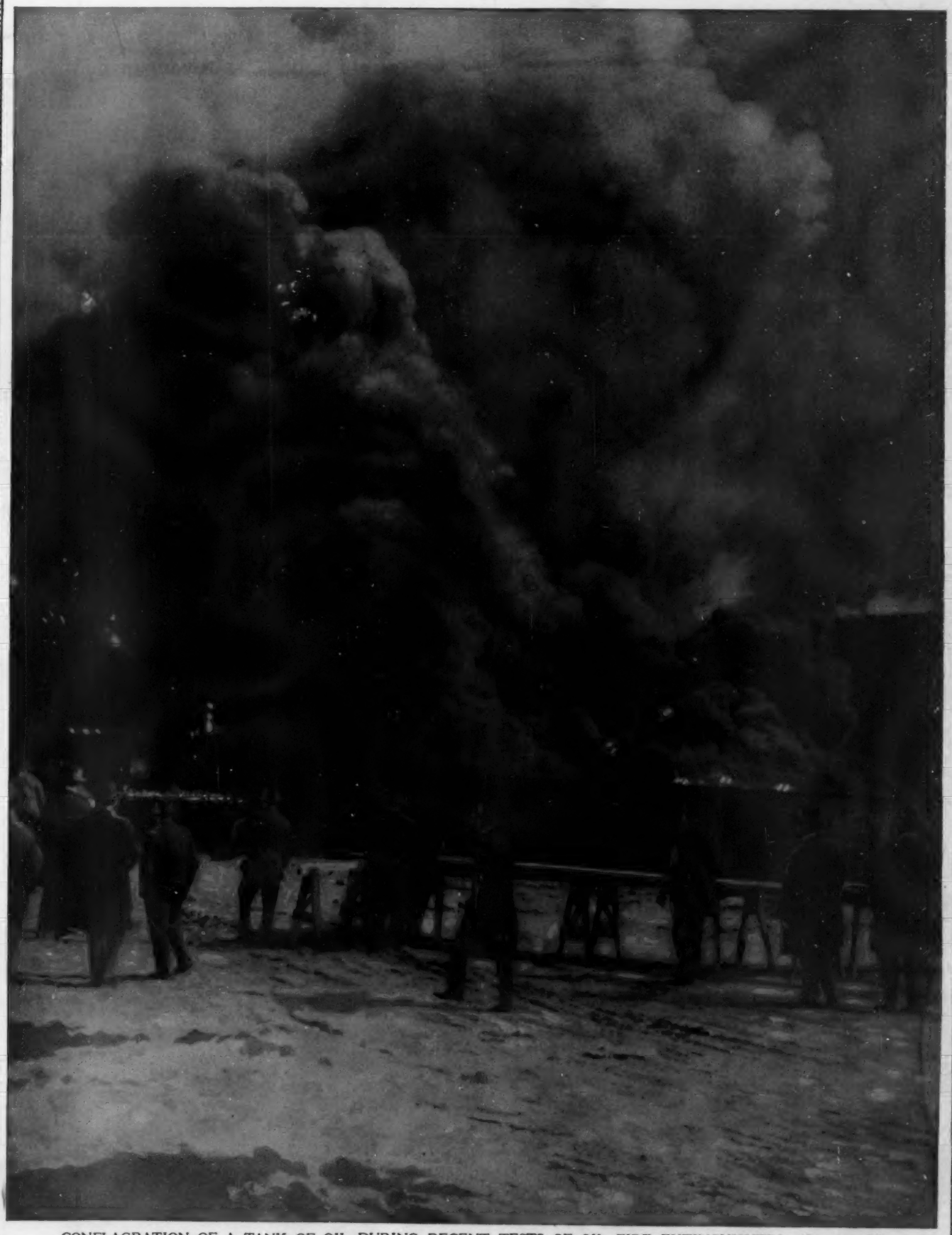
# SCIENTIFIC AMERICAN



CONFLAGRATION OF A TANK OF OIL DURING RECENT TESTS OF OIL-FIRE EXTINGUISHERS.—[See page 44]

July 8, 1916

Munn & Co., Inc., Publishers
New York, N. Y.

Price 10 Cents

# JIM HENRY
## CORRESPONDS

**I asked to be checked up on my statement if I appeared to run wild in my enthusiasm. A man out West thought he had me—sent in a hot shot and started something; and incidentally found out something new about shaving. Like other public men, I print the letters.**

Jim Henry

*The Hot Shot*

Gerhard Mennen Chemical Co.
Newark, N. J.

*Gentlemen:*

Your Jim, who wrote that blithe page in *The Saturday Evening Post*, is all wrong. He says: "My English may not be there, but the facts are straight." Which I wish to remark that his English is not only "there" but way out "here." It's direct action English with a regular Kipling kick.

But slip this to Jim, along with my kindest regards. Lather doesn't soften the beard. It hardens it. (I drew blood that time—what?) The soap takes the oil out of the hair, and makes it stiffer, the idea being to resist the razor and be easier to cut! Now if the beard were real soft, the razor wouldn't cut it at all. But the stiffer the lather makes it, the better it is. The lather props it up for the big killing. You know you couldn't cut a chicken's head off with the sharpest axe unless you rested the head on a block. Get me?

Also—just to make Jim feel good—my beard is one of the *other* kind—I've *always* had to rub the lather in, and past experience makes me mighty dubious about that "only-half-an-inch-of-cream" stuff.

Merrily yours,
Will Davis.

*The Come-Back*

Mr. Will Davis,
The Thinkograph, Lick Bldg.,
35 Montgomery Street,
San Francisco, Cal.

*Dear Bill:*

Your Bret Harte broadside from the Golden Gate is what we like because it gives us a chance to lay some more facts before you.

Now listen. We *might* counter by saying that if the function of lather were to harden instead of soften the hair, then the stiffer and more barb-wiry beards wouldn't need any lather at all.

Mennen's Shaving Cream hasn't made good by accident. The Mennen chemists have produced a real performer because they have overlooked no facts whatever in their careful study of this whole job of shaving—its mechanics, its chemistry, and the real inwardness of soaps. They know more about these things than anyone else in the business.

It *is* true that the lather removes oil and dust from the surface of the hair—which gives the razor a clean surface to bite into. But this is only a part of its job. It is also true—as all dermatologists agree—that the human hair is *pervious to moisture*, and that the more moist a lather is, the greater its effect on the human hair, and consequently the more it softens the hair.

Some soaps will not fully dissolve within the ordinary time of a shave. Mennen's is in a state of ready solubility in the tube, so makes *quickly* a fully dissolved lather. It will also absorb nearly four times the average amount of water. This assures that moist, *softening* lather—in either hot or cold, hard or soft water.

We believe it is made more carefully than any other soap—our tests run to 1-100th of one per cent and we *know* there is no free caustic. It contains a high percentage of soothing ingredients. When we urge you to follow our directions to the letter, we do so because it is really different. It's best to believe the painter when you see the "Wet Paint" sign.

The best thing we do is to solve the shaving problem for the man with the "other kind" of beard, like yours.

Yours sincerely,
"Jim Henry."

*Guess You're Right*

San Francisco, April 14, 1915

Jim Henry,
Gerhard Mennen Chemical Co.
Newark, N. J.

*Dear Jim:*

Well, I had it coming. I guess you've got the right slant on soap. Every time I shave—I now use Mennen's—I think of how these scientists can puncture a theory until it looks like a sieve. A barber once explained to me with a fine air of probability that soap took out the natural oil and left the hair stiff, etc., like I wrote you. Then came your ad, and I figured I'd just slip this Jimmy boy a little info. I did, and then and there got mine.

Now, listen, yourself. I read your circular through twice. Then I forgot everything I ever knew about shaving and went at it exactly according to directions. It was hard to forget the old rubbing-in habit, and the half-inch looked kinda small until the lather came up rich and creamy just as you predicted. It's there, Jim, it's there. I'll take it all back. A little more lather, James. Yes, you can also shave my neck. And while you're at it, give me a shampoo. Hair cut? No, I've just been singed.

Sincerely,
Will Davis.

**If you are skeptical, too, let's hear from you. The typewriter is still responding to the well-known touch system. But first send in the coupon, and test my proposition at first hand. And just to meet me half-way, read that little circular and believe me when I say that you will get results.**


This Coupon brings you two samples for 10 cents

GERHARD MENNEN CHEMICAL CO.
Laboratories:
1717 Orange Street,
Newark, N. J.

Enclosed is 10c for which please send me a medium-sized tube of Mennen's Shaving Cream and, free, a trial can of Mennen's Talcum for Men.

Name_____

Address_____

City_____ State_____

*". . . . it was Toby's delight to clamber up behind his master and to eagerly sniff the clouds of Virginia tobacco."*

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Plain or Cork Tip


The subtle richness and delicate aroma of their "bright" Virginia tobacco are not to be found in any other cigarette. Also in attractive tins, 50 for 40 cents; 100 for 75 cents. Sent prepaid if your dealer cannot supply you.

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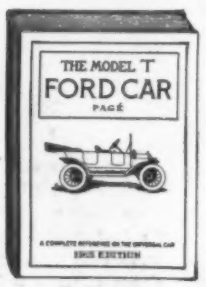


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**233 Broadway** **Woolworth Building** **New York, N. Y.**

SEVENTY-SECOND YEAR

# SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

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## How the Shrimp Industry Saved Fernandina

By Charles M. Maigne

FOR a number of years preceding the outbreak of the war, the little city of Fernandina, Fla., enjoyed a considerable measure of prosperity, mainly through the exportation of lumber and naval stores. Its wharves were taxed to capacity by the bustle of loading steamers of various nationalities, and the freight yards were usually crowded with cars bearing products for export.

With the genesis of war, however, all that was changed. No more would foreign ships brave the dangers of enemy cruisers; and there remained no vessels for ordinary freight transportation, for all were immediately pressed into the service of war munition supply and rates took a bound that placed local commercial activity truly *hors de combat*. Prosperity vanished into thin mist. Lumber and naval stores piled up on the docks, business houses became involved, and a large portion of the male population was thrown out of work.

Among those affected were the bar pilots. These are naturally seafaring men, to whom the ocean has been a means of livelihood; and to it they turned in their day of adversity. For a time there occurred phenomenal runs of bluefish; but these finally ceased to come, though pilots and fishermen sought them assiduously.

One day one of the pilots discovered that shrimp in vast quantities were to be found outside across the bar and northward along the coast. It occurred to him that trawling might pay, and he rigged up a boat and tested his theory. The results surpassed all expectations; he returned to his wharf day after day with huge catches of the delicate crustaceans. The news spread and market fishermen flocked to Fernandina to engage in the remunerative pursuit.

To-day there are in the neighborhood of 150 boats engaged in shrimp catching from Fernandina alone, while nearby towns, as St. Mary's and Brunswick, furnish many more. On a good day the catches average 20 bushels per boat, bringing at the wharves about a dollar a bushel.

A day with these catchers of "sea mice" is full of interest.

Long before dawn there begins a clatter of motor-boat exhausts stabbing the night with staccato shrillness. A twinkle of emerald and ruby running lights fills the harbor and fairway leading to the sea, and the procession continues till after six o'clock, by which time most of those seriously engaged in shrimping have got under way.

As the boat settles down for the run to the bar, about 6 miles out, preparations are made for handling the trawl. The majority of the boats use a spreader-bar lashed athwartship, with guides at each end for the lines. Cabin room is reduced to a minimum, usually nothing but a protective covering for the engines. Great boxes are built in amidships to hold the catch after it has been sorted in the small cockpit directly abaft.

The trawl itself is about 50 feet in length, tapering to an elongated tail that is stopped by an easily released lashing. From this tail extends a line of small floats, so that in case of accident the net may be located and recovered. The throat of the trawl is about 40 feet in width, the bottom edge weighted with lead, while the top carries floats to keep the mouth open. At each side of the throat sheer-boards are placed, to which, at top and bottom of the narrowest dimension, the upper and lower sides of the net-mouth are secured.

Chains form a bridle on the boards, set well forward so that when pulled through the water the boards tend to sheer outward, stretching the throat of the trawl between them and leaving the lower lip of the mouth of the net to drag along the floor of the sea.

The depth in which trawling is carried on varies from three fathoms to about twelve; to insure that the trawl is on bottom while cruising the cables are paid out to about thirty-five fathoms; while the boat never exceeds a speed of 4 miles an hour, lest the trawl be lifted off the bottom.

The various boats scatter far and near in search of the most favorable ground. The men are so adept in handling their boats and trawls that they can appear to be on the verge of running down a fellow craft, but, relying upon the pivoting drag of the trawl, turn in an instant and slowly draw away from the dangerous proximity.

The first run. Spreader bar showing trawl cables

Hauling the trawls

Shipping the shear boards

When the order comes to pull trawl, the motor is stopped and the boat broaches to in the roll of the sea. Two men heave on the cables and they are slowly gathered in. When the boards come to the surface they are seized by the handles and brought aboard. Then the net is gathered in from both sides at once, and the real pull begins. As the net comes aboard it is shaken with each handful to dislodge the shrimp and small fish that cling to the mesh. At last the distended tail is brought to view, the water surface included within its extent being whipped to a froth by the scurrying of the captured shrimp and fish. The sides of the net are made fast and the dip-net utilized to remove the bulk of the catch, for it would possibly tear the trawl seriously were attempt made to lift it bodily; and in any event, the weight would be too much for the small crew to handle.

A capacious dip-net full of fish and shrimp is emptied into the cockpit with a spatter and thud, while the remainder of the crew struggles with the trawl hanging overside. Time and again the dip-net must make its exploration into the trawl. A great commotion occurs within and the gaff is called for. A tremendous stingaree is hooked and, with an effort, pulled clear and permitted to slide off into the sea. A small shark lashes about—and they frequently cut the nets—is gaffed, and sent in pursuit of the stingaree. Sometimes a sea turtle is scooped up; but he is captured, for green turtle soup is a delicacy.

As the pile of the catch grows in the cockpit it is seen that there are many varieties of small fish with the shrimp. Silver and dun-colored eels, angel-fish, perch, toadfish, whiting, young trout, small sole and flounder, menhaden, starfish, sunfish, blackfish, small drum, squid, and countless others; all are there, squirming and flopping on the slimy pyramid of the catch.

When the contents of the trawl have been sufficiently reduced by the dip-net, the crew heaves the balance of the net aboard, the lashing is released, and the remainder of the catch cascades to the deck. Once more the trawl is cast, and the next run is commenced.

The crew then proceeds to pick shrimp. Great bushel baskets are upended in the cockpit and the hands of the crew comb the mass to gather the long red whiskers of the shrimp, by which, when lifted, a cluster of the crustaceans dangles. The clinging fish are shaken and picked out and the shrimp tossed into the baskets. As each basket is filled its contents are poured into the shrimp-box, and a small fish laid aside on the hatch, that count may be kept.

And the gulls have begun to gather. They come scurrying from every direction, wheeling, soaring, dipping. The boy takes a shovel and dumps fish overboard. There is a series of swoops, and the screaming gulls plunge bodily into the sea after a choice morsel. They volplane to the surface for an instant, and without stopping their flight for a moment, snatch their chosen delicacy from the waves with unerring accuracy, bolt it, and swoop again for another.

So the shrimp now support Fernandina. So far as known, it is the only place in the United States where shrimp may be caught the year around in paying quantities. The town is there, very lovely, very sleepy, but the wharves over which the tide of commerce once flowed are given over to unsavory shrimp houses and there is seldom the stack of a steamer in sight. Business drones along, and the people of the community who are not engaged in the new industry, as well as those who are, get along somehow; but they pray that the great war may come to a speedy close, so that Fernandina may return to her old estate.

# SCIENTIFIC AMERICAN

**Founded 1845**

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Charles Allen Munn, President, Frederick C. Beach, Secretary.
Orson D. Munn, Treasurer, all at 233 Broadway

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*The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.*

*The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.*

## The Men Behind the Men

WITH the nation-wide example of the week of June 18th, it is rather probable that not for many years has there been so refreshing a display of practical patriotism as that which has generally characterized the United States' response to the President's call for mobilization and recruiting of the National Guard. The history of the country offers no lack of precedent where men were called in sudden national crises. Reviews of our affairs point out that there has rarely been a lack of "men behind the guns." That they have been untrained for the tasks imposed upon them, as they shut their desks and quit their shops and laid down tools where they were working is no discredit to *them*. Rather is it to their credit, since they were willing to leave all, knowing the resulting odds, at the behest of a National policy which has only used preparedness as it was needed. Of patriotism there may be, and let us hope there is, no end; but a chronic lack of application needs no more proof of its criminal wastefulness of the untrained men who have to be its sponsors whenever there is need.

Such a need did apparently rise, to the end that June 18th the President issued his call for the militia of the States, and in 48 of the United States men left their work and answered. Due to a popular apathy, there were many of the regiments which in men were even far below peace footing and a company strength of 65, so that recruiting was the first necessity. Physical requirements were made high and have been kept so in anticipation of rigorous demands. Nevertheless, within one week the National Guards of practically all States were ready, their ranks at 65, reaching in some cases 150, their personnel made up of some green men, nevertheless outnumbered by the old. The difference, then, between a regiment of Volunteers, where all are green, untrained, and one of National Guardsman, where the new are, so to speak, automatically absorbed, is somewhat satisfyingly in favor of the Guard, presupposing that willingness, patriotism, and an eagerness to serve are equal.

In the cities recruiting has been progressing enthusiastically and at the same time thoughtfully, for people now are rather well aware of modern war in practice. To date there has been seen, not lack of men, *lack* only of such equipment as our modest preparedness has seen fit to care for to a very inadequate extent. Yet no factor has so contributed to the success of finding men to go behind the guns as the attitude of other men who stand behind them.

Inside the week in one of the smaller Eastern States, and there is no doubt that this is typical, 1,300 new men joined the colors. In Baltimore 52 firms, small stores, hotels, rich companies, large public service corporations, of whose employees more than 400 were Guardsmen, pledged their support of the men who were patriotic enough to sacrifice themselves, their work, and all their other ordinary interests for the welfare of their country. They guaranteed the men their pay and their positions, some of them both and all of them the latter, should they return in one month, in one year, or more. That in the meantime they may go about their tasks with light hearts, clear heads, and the assurance that behind them all is well. Many firms have also underwritten the support of each man's family for at least a year, in the event that he might not return.

This is not a small nor easy task. It is a splendid one, but it may call for sacrifice and loss of business, curtailment of new or usual activities. Yet they have reasoned that their men are sacrificing, too, in offering that beyond which no man can give more. But—and here is the less pleasant part—in very many of the business firms no aid is offered to the men who had not joined before the presidential call. This is unfortunate, for the man who joins *to go to war* can hardly be less worthy than those who join in time of peace. There is no benevolence or charity attached to it; it is the duty of those who do not go to those who do. Lodges, clubs, and labor unions are doing much for patriotic members; cities have pledged their aid officially as far as possible; States as States and through their people have tried to do a share; and the House of the United States has been attempting to assist its married Guardsmen. Should they all succeed, and they will do so only partially, there still is opportunity for broad and more personal practice by employers in freeing their men, irrespective of condition or responsibilities, that they may do their share in the duty of all.

Whatever else the patriotic firm may lose, there will be no loss of prestige; that is certain. They have done a fine, far-sighted thing. But like the workers for preparedness, who still have not lifted up their voices and busied their hands in vain during the European turmoil, they are the exception, not the rule. It is common to hear on the street, "I'd go to-morrow if I could. But there are others who depend upon me, and I do not dare to take the risk." Under our benevolent system, that is what the few are expected to do—which shows the chief advantage of conscription. Since we have none of that, these men and firms have shown another way. It is a way that ought to be encouraged by every means we know.

Fully cognizant of these facts, the President on the 21st of June wrote to a business man to say that "The patriotic response of the business men of America in the present unusual circumstances of the country has been what I personally confidently expected it would be, and it affords me genuine pleasure to have this opportunity to express my admiration and gratification." So far, so good.

Every employer of labor, of a thousand men or one, has an opportunity: he may discourage his men in their wish to serve, restricting their duties to him, to themselves, to their country; or he may place a little risk upon his business while they go out to risk their lives. We may have need of men behind the guns. We need, already, *men behind the men.*

## With Our Airmen in Mexico

NO more difficult ordeal could have been imposed on our embryo aerial fleet—and for that matter on any aerial fleet—than scouting duty in Mexico. For it is a fact that every detrimental condition known to aeronautics is encountered in the air above the high Mexican plateau; and the ground offers no respite to the weary aviator, for the deserts are thick with low brush, which is a constant menace at both the start of a flight and the end of a flight.

What became of the first fleet of eight tractor biplanes sent to Mexico to accompany the punitive expedition is now a matter of history. It is also known that twelve machines were sent down some time since, to replace the original eight that were converted into almost worthless debris after three weeks' actual service. However, it is not so generally known that almost unbelievable obstacles have prevented the airmen from using the new biplanes in actual service up until the moment of writing.

American airmen and airship constructors were not prepared for the unusual flying conditions of Mexico; at least, if they were they made no preparations to meet them. The result was that machines that had given satisfactory service in various parts of this country proved inadequate for their intended purpose south of the Rio Grande.

In the first place, the sand of the Mexican deserts is so light that the weight of the aeroplanes cause the wheels to sink deeply, making it extremely difficult to attain sufficient speed to leave the ground. This impediment, fortunately, has been solved by using a new flat type of tire.

Another obstacle is presented in the high temperature in that section of Mexico now occupied by American troops. It is reported that the water in the radiators often reaches a temperature of 120 deg. with the motor standing still. This trouble, however, is being met by providing deeper radiators, which offer greater cooling areas to the circulating water.

Undoubtedly the chief of the multitudinous troubles is the propellers. Propellers which have been subjected to the most rigid tests at the factories, such as test runs of several hours' duration without showing any signs of weakness, go to pieces only a few minutes after they are exposed to Mexican air. The air is so dry that it has an effect on the wood of the propellers far beyond anything imaginable; furthermore, the rarified air causes the engines to turn the propellers at a higher speed, hastening the destruction of the latter. But then, again, propeller trouble is only a constructional shortcoming, and undoubtedly it can be remedied by careful study and application.

The aviator in Mexico only meets the real tribulations when he is actually in the air; the difficulties previously mentioned are concerned with the constructional details rather than with actual flying. Because of the fierce heat of the sun beating down upon the sandy wastes, there are not only varying air currents, but also violent whirlwinds. Although these can be seen from the ground, they are invisible to the airmen while in flight. As a result, he is caught without a moment's notice in the grasp of a furious whirlwind, and unless he is able to maneuver his machine promptly and effectively—always taking it for granted that the materiél is as capable to weather the winds as the personnel—the incident must end disastrously. It is said of these whirlwinds that machines, standing on the ground, have been suddenly caught in the whirls and spun around and overturned.

With high temperature, rarified and dry air, rising and falling air currents, whirlwinds of a most violent character, and soft sands covered with low brush, American aviators have a worthy task before them. If extensive use is to be made of the aeronautical branch of the Army—and most likely there will be, since aerial scouting is the only effective method in a country of such extensive and difficult terrain—we must expect rapid deterioration of the air service. Wastage in both men and equipment is sure to be high. Although fortunately the Government has ordered additional machines for service on the border and in Mexico in the event of war, it is certain that unless many more machines are ordered and continue to be ordered, and unless more men are trained as aviators, there will often be times when the Army will be without proper aerial assistance.

## Our Industries a Power for Peace

FROM time to time the SCIENTIFIC AMERICAN has called attention to the excellent work that is being done by the Naval Consulting Board. It may be asked what bearing has this work on our present trouble with Mexico. As a matter of fact, the war which is threatening us, as we go to press, and which may actually have begun before these pages are read, does not promise to be of sufficient importance to put our industries to the test. Foreign orders for munitions have developed our facilities to a sufficient extent to enable us easily to equip our army, even should it expand to a quarter of a million men.

While the sudden call to arms of our National Guard has been pointed out as a test of our preparedness, we must remember that any trouble we may have with Mexico alone is not at all comparable to a war with a first-class Power. Mexico is in the peculiar position of having to depend upon us for its supplies of ammunition. Hence we will not have to compete with a nation whose army is backed by a fine industrial organization.

Some idea of difficulties we would have to contend with, were Mexico a first-class Power, may be had by reading the article on "America's Industrial Organization for National Defense," by Thomas Robins of the Naval Consulting Board, which appears on another page. He brings out the startling fact that to-day, in England, despite the activity of her industrial plants and the aid that has been given by our industrial plants, there are one and a half million trained soldiers drilling without rifles, while in Russia the number of unarmed soldiers is more than twice as great. Although our plants have been very busy ever since the war began, not a single American rifle has yet reached the battle-front in Europe, and the production of our rifle cartridges has been so small that it is merely used for target practice in Great Britain and Russia.

The Naval Consulting Board is performing a signal service in organizing the industries for national defense. As Mr. Robins points out, "we possess fully one-half of all the industrial equipment of the world; when we have learned to use it for national defense, *we shall certainly be too strong to have to fight.*"

## Difference in Water Levels of Atlantic Ocean and Gulf of Mexico

THE United States Coast and Geodetic Survey has recently undertaken the task of determining the difference in the mean level of the water surfaces of the Atlantic Ocean and the Gulf of Mexico. A representative of the survey has been sent to Florida to carry a line of precise leveling between the tide gages at Fernandina and St. Augustine, on the Atlantic coast, across the Florida Peninsula to the tide gages at Cedar Keys, on the Gulf coast.

The question whether or not the Gulf is higher or lower than the Atlantic has been a subject of much discussion among scientists, and the results of this work should clear up the matter. The secondary benefit which will result from this line of precise levels will be the establishment of many bench marks of a substantial character whose elevations above sea level will be determined. These bench marks will be used by surveyors and engineers who work in the territory crossed by this line of levels.

## Radio Communication

**Amateur Wireless in Holland.**— It is reported that a movement is on foot to start a wireless society for Dutch amateurs. There are many keen wireless amateur enthusiasts in Holland, and accordingly there should be no difficulty in forming a wireless organization comparable to many in the United States.

**Wireless Station for New York Police.**— There has recently been installed a wireless station at the New York City police headquarters as part of the general preparedness plans which the police commissioner is introducing. The apparatus has a range of about 500 miles, being a Marconi 1 kw. 500-cycle quenched-gap set. Some 20 members of the Home Defense League have wireless apparatus installed in their homes in various parts of the city, near police stations. By means of a private code it will be possible for the headquarters' station to transmit dispatches to these stations, which in turn will convey them to the nearby station houses. It is announced that wireless stations are to be installed in the important police stations of New York.

**Wireless and the War.**—Upon his recent return to London from Italy, Guglielmo Marconi, in an interview with British journalists, gave the following information: "New developments will not only make wireless communication in this war more efficient than ever before, but will make it more difficult for the enemy to intercept messages. These improvements will apply to instruments in aeroplanes and airships. Hitherto aeroplanes have been at a disadvantage with airships in wireless work, for although they were able to transmit messages, they have not been able to receive them. This was because the receiving signal was too faint to be distinguished, being drowned by the noise of the aeroplane engine. Now we have been able to strengthen the receiving signal sufficiently to enable messages to be taken."

**Ecuador Restricts Use of Wireless.**—The Republic of Ecuador has recently enacted strict laws pertaining to radio communication within its jurisdiction. In substance they are as follows: All wireless stations situated in the country or in territorial waters are subject to the inspection and vigilance of the government. No subject of any of the belligerent countries shall be employed in any of the stations. No message in cipher or code from a belligerent nation or vessel shall be transmitted or received with the exception of those referring to the government service. No belligerent warship may make use of the wireless apparatus while in Ecuadorian waters. The transmission of a wireless message, even in ordinary language, indicating the course of either a belligerent or neutral warship, is prohibited.

**Radio Equipment of German Airships.**— It is gathered from reports that the new German naval and military airships are equipped with wireless apparatus of greater range than that employed heretofore. The aerial largely used in connection with the wireless installations on Zeppelins is said to consist of a phosphor bronze wire that is paid out from a spool as the airship rises, to its full length of 750 feet. The radio equipment is extremely compact, and power is furnished by a small generator weighing 270 pounds. The apparatus is such that the danger of sparks, either in the instruments themselves or in neighboring objects through the influence of induction, is reduced to a minimum. Every large aerodrome in Germany has a wireless station, which enables the airships to keep in touch with their bases. The Zeppelins have a range of about 120 miles, and when it is remembered that the messages may be relayed from one craft to the other, it becomes obvious that on many of the raids over England the commanders of the airships no doubt remain in communication with the authorities at home.

**Relay for Radio Receptors.**— In a recent issue of the London *Electrician* there appears a description of a new relay which is claimed to be superior to the Dary, Ducretet and Brown relays with respect to natural frequency and sensitivity. Essentially the relay consists of a separately excited pot magnet in the narrow air gap of which there is a coil, consisting of several hundred turns of No. 50 insulated copper wire wound in one layer on a pot-shaped celluloid former, which in turn is carried on fine metal wires. The latter also serve as leads for conveying current to the fine winding. The whole instrument should be spring-suspended under a dust-proof glass bell, and the local current controlled by the relay contacts should not exceed 100 microamperes at 1.5 volts; this current may be used to operate a step relay actuating a Morse printer. The inductance of the step relay must be neutralized by a non-conductive resistance in parallel and by a condenser across its contacts. The relay is only suitable for use with electrolytic detectors; crystal detectors give no results. By using two or more electrolytic detectors in parallel, the relay can be made to record signals which do not affect it when a single detector is used.

## Science

**A New Signal Light,** designed for use in the triangulation operations of the U. S. Coast and Geodetic Survey, consists of a tungsten lamp so made and mounted that the filament is practically at the focal point of the parabolic reflecting mirror. It is operated by dry cells. This lamp has been tested at the Bureau of Standards, which reports that for 2 volts at 2 amperes it gives 250,000 candle-power in the beam at 100 feet. The oxy-acetylene lamp heretofore used by the Survey, a much bulkier piece of apparatus, gave only 1,500 candle-power in the beam at the same distance. According to the designer, Mr. E. G. Fischer, it will be possible with the new light to make observations on 20 to 30 per cent of the nights now lost in triangulation work.

**What is a Blizzard?**—A discussion has been going on in the columns of the English journal *Nature* as to whether the term "blizzard" is applicable to any kind of weather ever experienced in Great Britain. The typical blizzard of North America is characterized by intense cold, as well as by a high wind and fine, powdery snow, or needles of ice. We have no monopoly of such storms—the worst known anywhere in the world occur in Antarctica—but Great Britain probably never experiences a typical blizzard in this sense of the term. However, even in this country the word "blizzard" is somewhat loosely applied to heavy snowstorms accompanied by high wind. The great "March Blizzard" of 1888, which tied up traffic in New York City and elsewhere in the northeastern states, was not characterized by extremely cold weather, nor by the fine, icy snow of western blizzards. In the same broad sense the word "blizzard" is now well naturalized in Great Britain. Mr. L. C. W. Bonacina says that in Devon and Cornwall the severe snowstorm of March 9-13, 1891, is commonly referred to as "the great blizzard."

**The New Weather Observatory in Cincinnati** is described in the last annual report of the U. S. Weather Bureau as "practically the first suburban meteorological observatory established by the Weather Bureau," and its location is especially appropriate because the national weather service was virtually begun at the Cincinnati (astronomical) observatory in 1869 and 1870, under the initiative of Professor Cleveland Abbe, who recently retired from active duties on account of ill health. The new observatory is situated on elevated ground in Clifton suburbs, in the northern part of the city. The downtown station of the Bureau, in the Federal Building, is to be maintained as a printing and business office. This arrangement represents an ideal toward which the Weather Bureau has been working for a long time, and which will probably be realized eventually in most large cities; *i. e.*, the location of the observatory proper in a spot removed from the artificial conditions prevailing in the city, and the maintenance, in addition thereto, of a business office in a convenient downtown location. This plan is followed to a considerable extent in Europe. In Paris, for example, the administrative office of the Bureau Central Météorologique is in the heart of the city, while the observatory, the reports of which are published on the weather map as those of "Paris," is at the Parc St. Maur, several miles out of town.

**"Miracle" Wheats.**— A recent bulletin of the United States Department of Agriculture describes the variegated and romantic history of two varieties of wheat, which, under a great many different names, have been offered to farmers at exorbitant prices on the basis of unwarranted claims in their behalf. One of these, lately exploited under the name of Alaska wheat, was probably introduced in colonial days, and was known under the name of Jerusalem wheat as early as 1807. It has a much-branched head, and this characteristic is claimed by its promoters to indicate that it will give immense yields, ranging from 100 to 222 bushels to the acre. This variety has also been sold under the name of Egyptian, Miracle, and Mummy wheat; also "wheat 3,000 years old." These names connect it with the well-worn and absurd tale of wheat having been grown from a kernel 3,000 or 4,000 years old, found in an Egyptian mummy-case. Alaska wheat was extensively advertised in 1908 in connection with the story that an Idaho farmer, after years of experimenting, had produced a variety of wheat in which the central head was surrounded by nine other heads, and which would, therefore, yield a crop from six to ten times greater than ordinary wheat. Although this story was exploded by the Department of Agriculture, and a fraud order was issued against the promoting company by the Post Office Department, Alaska wheat continued to be exploited, and was actually placed on exhibition at the Panama-Pacific Exposition. The other much misrepresented wheat described in the bulletin is one of the soft red winter wheats, and was introduced about ten years ago under the name of Stoner, or Miracle wheat. The claims made for it, including that of remarkable tillering power, have been completely disproved by the tests of the Department of Agriculture and the state experiment stations.

## Industrial Efficiency

**Regrinding Broken Taps.**— By devoting a few moments' time to what has presumably become an absolutely worthless tool, a broken tap may be ground into a suitable shape for further use. The first step is to square the end of the broken tap on an ordinary grinding wheel, followed by the grinding of the relief or chamfer. The result is a tap that may be used for practically the same work as a new tap.

**Daylight Saving in France.**—The Senate Committee in France recently rejected by five votes to three the proposal for daylight saving. The reasons for its rejection were doubtful economy and serious inconvenience. The committee considered it was "not wise to regulate artificially the lives of persons who go to bed too late at the expense of the portion of the population which already carries out daylight saving."

**Blowing Cotton from One Department to Another** through suitable tubes is the latest employment of compressed air in manufacturing plants. In one instance a California felt manufacturer makes use of compressed air for conveying damp wool from the scouring plant squeezers to another building across the street, in which are located the sun-exposed drying rooms. The method is said to be clean and rapid.

**Clam Shells for Fertilizer.**— A firm situated in a small town in New Brunswick, Canada, is grinding refuse clam shells and mixing them with other materials for use as commercial fertilizers. In the past many towns on shores where the clam industry abounds have utilized these shells, if at all, for improving city roads. At one point on the Maine shore it is reported that about 50,000 bushels of clam shells are left following the winter clam-canning season. The cost of utilizing the product prior to grinding at the factory is the expense of transportation by vessels.

**Electrically-Heated Turners' Irons.**— The average cost of repairing patent-leather shoes going through a Massachusetts shoe factory formerly averaged 2½ cents per pair on the entire production of the plant, according to the *Electrical World*. After considerable experimenting to reduce this item of expense, a number of electrically heated turners' irons were installed, and now these, after a number of months' actual use, have reduced the cost of repairing the patent-leather shoes to 1⅛ cents per pair. As the factory makes on the average 1,000 pairs of shoes per day, a saving of $13.75 per day has been effected, or a saving of $3,437.50 in a working year of 250 working days.

**Two True Types of Near Accidents** are mentioned in a recent issue of the *National Safety Council*. One can be made harmless by proper safeguards; the other type is seemingly unforeseeable and unpreventable. The first is the bursting grinding wheel, which injures no one because of the use of safety flanges. The second was an actual incident in a manufacturing plant, in which the head of a sledge hammer, long in use, broke in two lengthwise and flew off violently, narrowly missing a man's head. In this instance there was no flaw visible on the outside of the hammer head, and although the surface of the break showed the rust of time, all along its edges was a narrow margin of clean, gray metal.

**New Woods for Paper-making.**—Tests have recently been conducted at the Forest Service laboratories at Wausau and Madison, Wis., with the idea of developing new methods and improving the old ones used in manufacturing ground wood pulp. The tests show that eleven new woods give promise of being suitable for the production of news print paper, while a number of others will produce manila paper and boxboards. Most of these woods are confined to the West, while the groundwood industry now obtains the bulk of its raw material from the East. It is thought that pulp-making plants must eventually move to points where they can obtain a plentiful supply of wood and an abundance of cheap water-power, two prime requisites in the business.

**Saving of Waste Paper Material.**—Several foreign governments, realizing the scarcity of paper-making material, have forbidden its export to other countries. The effect of this has been widespread, especially in the United States, where the demand for raw material now is greater than the supply, with resultant high prices. Obviously, corresponding increases in the cost of all kinds and grades of paper have taken place. It is wise to save waste paper, rags, etc., for they are valuable. There is at present an increased demand for paper, cardboard, etc., in the United States. The present daily production of paper of all kinds is over 15,000 tons. Competent authority states that rags form 7.8 per cent of the fibers we use in paper making; waste paper, books, magazines, etc., form 21.4 per cent. Saving old paper and rags means a saving of the forests. The hearty coöperation of every man, woman, and child is essential if the collection of waste materials is to be made a success.

# The Miracle of Motor Transport

## How Verdun, Cut Off from the Railroads, Was Saved

By Joseph Brinker

A convoy of Paris motor buses carrying troops halted behind the lines at Verdun, awaiting orders

VERDUN, like Paris, was saved by motor trucks. From that memorable day at the Battle of the Marne in 1914 when the Army of Paris, 60,000 strong, was suddenly thrown on Von Kluck's flank by means of several thousand motors and turned the tide of battle, to the defense of Verdun, which at this writing is still holding out, is but a short stretch in which motor trucks have performed two miracles.

To understand how motor trucks saved Verdun and why it was a miracle, one must first of all understand the position of the French at the famous old fortress and the strategy of the Germans in attacking it. The German attack on Verdun was a political one. Verdun is to the Germans what Alsace is to the French, for it must be remembered that it was at Verdun that the German Empire of Charlemagne was divided. To capture Verdun would be to break the spirit of the French people, who considered it an impregnable bulwark.

To General Joffre and his staff, however, Verdun was the weakest point on the entire line held by the French. Why? Because the quick demolition of the great fortresses of Liege, Namur and Maubeuge had demonstrated the utter futility of forts to withstand the fierce bombardments of this war, and because Verdun itself was a salient in the line, open to fire from the front and from the sides as well.

Besides, Verdun was the hardest point on the entire French line to supply, because it could not be reached by a single railway. It will be remembered that when the Germans took St. Mihiel in September, 1914, they cut the main railroad supplying Verdun, the Paris-Nancy line. After their retreat from the Marne they continued to make its use impossible by reason of their long-range guns set up at Varennes and Montfaucon. In consequence, the French were at first compelled to use a single-track, narrow-gauge line running north through Bar-le-Duc, which was entirely inadequate to supply the needs of the defending forces because of its grades and the slow service which it offered. Under these conditions Verdun was practically isolated because it could not be served by railway.

So long as Verdun was defended by a relatively small force, the bringing up of food and ammunition was a comparatively simple matter for the motor truck transport. But it became a tremendous task indeed when the Germans at the beginning of the attack massed a quarter of a million men and more than two thousand guns on this narrow front. In fact, it was such a tremendous task that it is now semi-officially confirmed that General Joffre ordered the evacuation of Verdun because of the great sacrifice its defense would entail. To him, Verdun, with its forts shorn of all their guns and defended by men in trenches and artillery in concealed positions, was exactly like any other point in the line.

In fact, it is reported that the capture of Fort Douaumont by the Germans was accomplished after Joffre had given the order to retreat. That Verdun itself was not also given up was entirely due to political pressure brought to bear on the military. It was here, then, that the motor transport performed its miracle of bringing up a quarter of a million men, supplying this great force with food and ammunition and removing the wounded. It was the first time in the history of the world war that any army of this great magnitude was dependent entirely upon motor transport. It must be remembered in this connection that the amount of ammunition expended by the French in the defense of Verdun is greater than that used in any other battle in the world's history, not even excepting last year's French offensive in the Champagne. It is indeed a miracle that motor transport was able to supply every single shell, in addition to bringing up a fresh army of perhaps more than a quarter of a million men, its rations, supplies and innumerable guns both heavy and light.

This miracle of motor transport was not performed in a day. In fact, if preparations had not been made many months in advance, it would not have been possible. These preparations consisted of the building of an entirely new road to the fortress and the working out of an intricate system to handle the thousands upon thousands of motor trucks of all kinds and descriptions which were called upon to bring forward everything which the army of defense required. It was this most efficient organization of the transport that made it possible under the most difficult conditions to keep the army reinforced and to supply it regularly with ammunition and rations so that the troops were able to arrest the most determined assaults since the war began.

The first problem of General Herr, in command of the forces at Verdun when the attack began, was that of roadways. He foresaw many months in advance the great handicaps the motor transport would be under in case of an attack on the fortress, and at once began the entire reconstruction of the one main highway running south from Verdun through Bar-le-Duc and St. Dizier. This road, at first, like the other average roads of France, fairly narrow, though with a good foundation, would not have been sufficient to prevent congestion and delays, costly if not fatal, when several thousand motor trucks had to run over it in both directions at the same time.

Accordingly, this road was entirely rebuilt. Army engineers laid down a new foundation, doubled its width in some places and tripled it in others. Turnouts were provided at certain specified intervals, on which trucks not working properly could be sidetracked and their troubles remedied. In every village along the route there were repair shops complete in every detail, filled with every conceivable part that might be needed to enable a damaged or broken-down truck to

**Paris motor buses taking troops through one of the villages back of Verdun**
Note the bullet holes in the home-made rear door and the gendarme with a whistle to his mouth, to control the traffic.

**The last stage of the haul where the motor transport is too valuable to be sent**
Carrying machine-gun ammunition in small horse drawn caissons from the Verdun sub-bases to the trenches.

regain its position, and equipped with everything in the way of machinery and tools that would permit such repairs to be made in the minimum of time. These stations were to be operated by details of experts, men who had made it their profession to know motor trucks and how to repair them without bungling and who could get them to work in the shortest possible period. In addition, natives of the country behind Verdun were stationed at the various villages behind the line to direct the truck drivers and maintain the traffic without congestion. Between the villages along the line, myriads of signs reading — To Verdun — were erected for the guidance of the transport drivers. Way back in the interior of France, thousands and thousands of motor trucks were held in readiness for the expected attack—some were to carry beef and rations; others nothing but ammunitions, and still others supplies and guns, guns of all sizes and descriptions—while all were to do their share on their return trips in rushing to the base hospitals those of the wounded who had any chance of recovery.

**One of the American-made trucks loaded with beef, just preparatory to being weighed before starting for Verdun**

With these preparations made, it was simply a matter of giving orders and of superintendence, but a tremendous job at that, to set this marvelous motor transport organization into operation once the attack was begun and the decision to defend the fortress was made.

For more than fifty miles back of Verdun the newly-built highway, out of range of the German guns at all points, was filled with a long procession of trucks, described by those who saw the work as a continuous stream or torrent more than a line of vehicular traffic. The preparatory organization was so perfect and the condition of the trucks so perfectly attended to that there was scarcely a break in the snake-like procession which moved forward with clock-like regularity. Advancing with their capacity loads, the vehicles discharged their burdens at predetermined points behind the front, whence the material was carried to the trenches by one- or two-horse carts. The return, empty or with wounded, was made like the advance, with the same military precision. All day and all night these great trucks ran, uninterrupted. They proved the salvation, the miracle of Verdun.

The following order of the day, issued by General Joffre to the officers and men of the motor transport of the Verdun army, testifies to the great value of the work which it has done:

"Since the renewal of the active operations in the Verdun sector, the motor transport has furnished a considerable effort in order to assure the transportation of troops, ammunition and food. Thanks to the fine organization of the convoys and the high sense of duty of the men, this has been carried out with the greatest regularity and in a remarkably orderly manner. The General in Chief expresses his highest satisfaction to the officers and men in these operations.

"(Signed) J. JOFFRE."

## The Launching of a 61-Ton Zeppelin

**By Baron Ladislas d'Orcy**

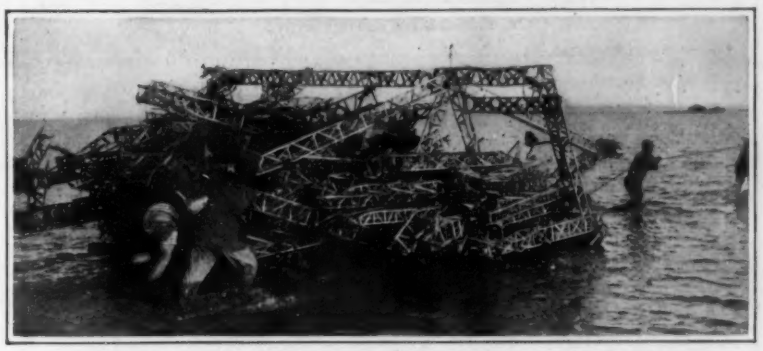
A HIGHLY interesting report has just reached this country from Romanshorn, a Swiss town on Lake Constance, about the successful launching of a Zeppelin of truly gigantic proportions.

Bits of news of this kind, frequent enough during the past year, have mostly been of such a fantastic nature that little, if any, credence could be attached to them. Unlike these stories, however, which seemed to be the products of fertile imaginations, the report from Romanshorn appears to bear every mark of verisimilitude, for the data it furnishes about the new aerial leviathan checks up well with one's knowledge of present-day Zeppelin design, and it tacitly implies evolution toward greater size.

The new Zeppelin, which has been seen when making trial flights over Lake Constance, is said to be 750 feet long and to have a volume of 54,000 cubic meters, or about double that of the 1914 naval type. The vessel has four armored cars mounting small cannon, several machine guns and launching tubes for bombs and aerial torpedoes; the power plant consists of seven 200-horse-power engines, each of which drives a propeller. It is claimed that the airship can attain an altitude of 15,000 feet; the vessel's weight is given as 40 tons.

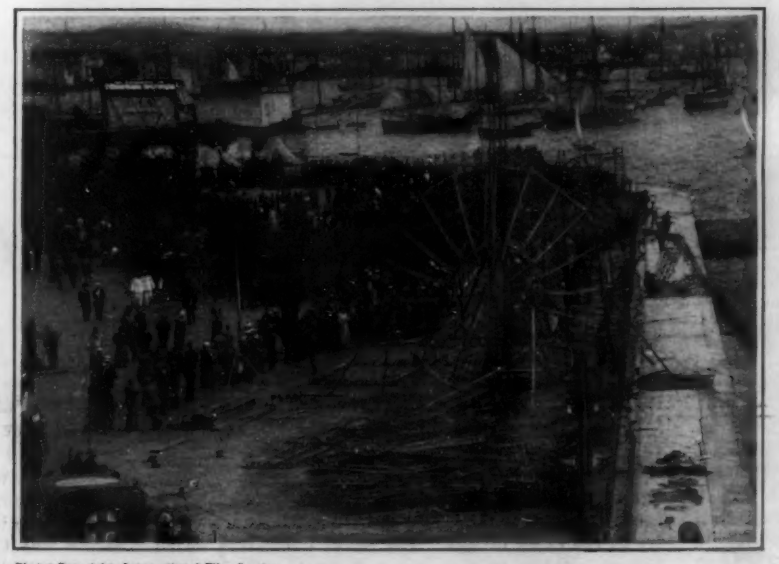
One possesses thus sufficient data for figuring out those the report omits. A volume of 54,000 cubic meters furnishes, at 15 deg. C. and at normal barometric pressure, a total or gross lift of 61 tons. The airship's dead weight (framework, envelope, gas-bags, engines and propellers) being given as amounting to 40 tons, there remains available a net lift or "useful load" of 21 tons. These figures amply vindicate the assumption, more than once expressed in these columns, that since the outbreak of the great war the Zeppelin's loading efficiency has risen from 25 to 35 per cent—a truly remarkable achievement.

Possibly the most interesting feature of this airship—aside from its size—is the number of its cars and engines. The fact that there are seven engines and propellers seems to imply that the novel practice of mounting one of the screws astern of the rear car—a practice quite heretical from orthodox Zeppelin design—has been adhered to in the 61-ton airship. Obviously it must have been giving satisfactory results. But it is a matter of conjecture how the remaining six engines are apportioned, although it seems likely that they are placed in pairs and drive propellers mounted on either side of the hull on outriggers. In this case either there are two engines in the first three cars and but one, driving a stern screw, in the rear car; or else the latter houses three engines and the bow car none. While the latter disposition may seem to cause an uneven distribution of weights, the stern being rather heavy, it should be remembered that this permits rapid climbing with the bow inclined upwards—a performance in which war-Zeppelins have proven astoundingly proficient.



**Raft laden with the aluminum girders of the Zeppelin L Z—85**

**Towing the debris of the L Z—85 to Saloniki**



Photos Copyright, International Film Service

**Reconstructing the ill-fated Zeppelin at Saloniki**

Incidentally the distribution of weights is also dependent on the position of the armament. The *LZ-95*, one of the latest Zeppelins, which possibly belongs to the 61-ton type carries, according to the *Kölnische Volkszeitung*, two small semi-automatic cannon and six machine guns, as well as launching apparatus for bombs and aerial torpedoes. The mounting of the guns is not disclosed, but it is known that ordinarily there are two machine guns to each car and, sometimes, two more atop the hull, on a light platform. It seems likely that the newest type of Zeppelin mounts her biggest guns, the two "semi-automatics," on the bow-car, where the gunners are afforded a wide sweep of the horizon. The mounting of three engines in the stern-car, as well as the altered design embodying as many as four cars, would then be self-explanatory.

A further proof of the fact, that, far from having adopted a standard design, the Zeppelin Works are still producing airships with greatly varying features, is furnished by a picture of the *L-20*, a naval Zeppelin, which stranded on May 3rd inst. near Stavanger, Norway. This vessel had no apparent gangway connecting the cars and its power plant is said to have consisted of six 200-horse-power Maybach engines, which appear to have been mounted in twin-units on three cars. Consequently there must have been six side-propellers mounted on outriggers and no stern screw at all. The dimensions of this vessel were given as amounting to 650 feet in length and about 80 feet in diameter, representing an aspect ratio of about eight to one.

Altogether this airship resembled very strongly the ill-fated *L-2*, which was the first Zeppelin without any gangway, the cars being directly connected with the hull—a practice that was, however, abandoned when the engine exhaust ignited the hydrogen and blew up the *L-2*.

The three accompanying views show the salvaging of the *LZ-85*, which fell in the Vardar marshes after being hit by British gunners. The parts of the ill-fated Zeppelin have been collected and on rafts towed to Saloniki, where the aluminum girders have been reassembled into a partial framework. This Zeppelin was 560 feet long and propelled by five 200-horse-power Maybach engines.

# America's Industrial Organization for National Defense

## By Thomas Robins, President of the Robins Conveying Belt Company, and Secretary of the Naval Consulting Board of the United States and Member as Well of Its Committee on Industrial Preparedness

THE case for Industrial Preparedness in America is this:

In former times the military strength of a country lay in the number and efficiency of its soldiers. The Roman soldier was armed with a short heavy sword. It was good for a lifetime, and one blacksmith could keep a legion supplied with arms.

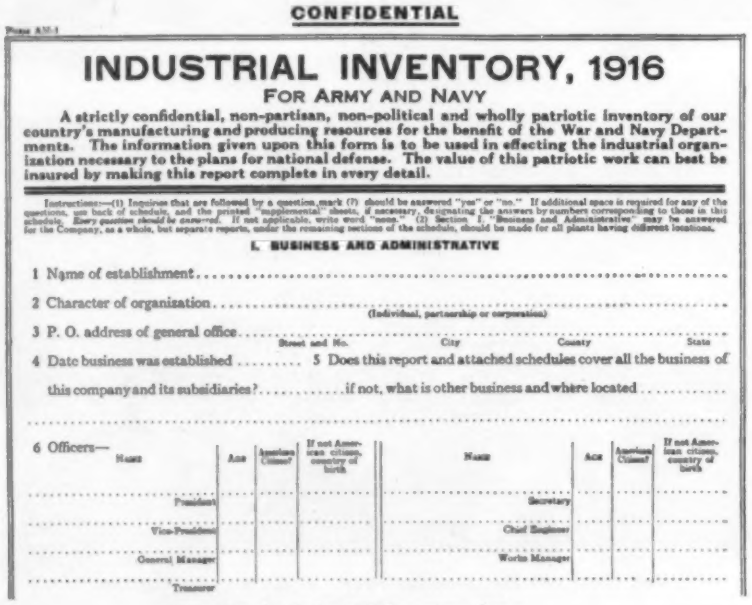
To-day the military strength of a country lies in the number and efficiency of its manufacturers. This situation is due simply to a change in the weapons of war. The modern soldier uses a three-inch field gun which can use up $10,000 worth of shells in an hour, or a machine gun which when operating for only 20 seconds out of each minute and at this rate for five hours per day, would require about a million dollars' worth of cartridges per annum.

Warships and increases in the Army are within the power of Congress and may come as a matter of course, but warships and trained soldiers will be worse than useless without a national industrial organization behind the fighting lines for the supply of certain necessary materials in unbelievable and unending quantities.

Congress has never discussed this problem because Congress has never realized that the problem existed. In fact, in Washington it has always been deemed risky to refer to the subject of munitions of war, for any mention of that matter might be interpreted as showing a friendly interest in the alleged "Munitions Trust." To hold his job a Congressman of the standard type must, at certain intervals, curse out the "Munitions Trust." It has been a most useful vote-getter. One over-zealous lawmaker, in his annual act of trampling on "Trust," disregarding the interests of his colleagues, nearly killed the goose by advocating a Government factory capable of turning out all the ammunition that the Army and Navy might require. But when the Ordnance Bureau pointed out that this factory would require an operating force of 750,000 men, he quickly dropped the subject as something too hot to handle. When our plan for organizing the industries for the production of munitions was first presented, Congress was afraid of it. It smelt of danger, but when each Member of Congress realized that it meant a share of the Government business for almost every manufacturer in his district, he jumped for it, and now the ghost of the Munitions Trust has been laid for all time.

After a brief study of foreign conditions it is easy to see who it is that must carry the real burden of a modern war. It is the manufacturers, for war can be carried on by the fighting armies only with the fully organized backing of the fighting industries. It is perfectly safe to say that if this country were now engaged in war, there would not be ten per cent of the manufacturers in the United States who would not be occupied in making war material of some kind or other. Whether they liked it or not they would have to do it. The life of the nation would require it. If any manufacturer refused to fall in line his plant would simply be taken over. At the least it would be stripped of its men. Suppose a doubting manufacturer says, "My business is the manufacture of phonographs. What serious use could the Army make of them?" It may be news to him to learn that he is just the fellow to turn out small shell parts. On the declaration of war his ordinary business would come to a standstill, but, under the plan of the Committee on Industrial Preparedness, without the loss of a day he would set all his men and machinery at work on Government orders. Or another may now make typewriters. A study of conditions abroad shows that he could turn out cartridge clips and certain fuse parts. These changes would take place quickly and smoothly, and with everything understood in advance by the business man, by his bankers and by his employees, there would be the least possible economic shock.

It is the purpose of the Committee on Industrial Preparedness by means of its great Industrial Inventory, first, to learn who and where the manufacturers are and what they make in normal times. Second, with their help and that of officers of the Army and Navy and of experts who have studied foreign conditions, to decide what they could make in time of war. Third, to teach them *now—in time of peace*—how to make it.



CONFIDENTIAL

Form AM-1

**INDUSTRIAL INVENTORY, 1916**

FOR ARMY AND NAVY

**A strictly confidential, non-partisan, non-political and wholly patriotic inventory of our country's manufacturing and producing resources for the benefit of the War and Navy Departments. The information given upon this form is to be used in effecting the industrial organization necessary to the plans for national defense. The value of this patriotic work can best be insured by making this report complete in every detail.**

Instructions:—(1) Inquiries that are followed by a question mark (?) should be answered "yes" or "no." If additional space is required for any of the questions, use back of schedule, and the printed "supplemental" sheets, if necessary, designating the answers by numbers corresponding to those in this schedule. *Every question should be answered.* If not applicable, write word "none." (2) Section I, "Business and Administrative" may be answered for the Company, as a whole, but separate reports, under the remaining sections of the schedule, should be made for all plants having different locations.

I. BUSINESS AND ADMINISTRATIVE

1 Name of establishment.....

2 Character of organization..... (Individual, partnership or corporation)

3 P. O. address of general office..... Street and No. City County State

4 Date business was established ..... 5 Does this report and attached schedules cover all the business of this company and its subsidiaries?.....if not, what is other business and where located.....

6 Officers—

| | Name | Age | American Citizen? | If not American citizen, country of birth | | Name | Age | American Citizen? | If not American citizen, country of birth |
|---|---|---|---|---|---|---|---|---|---|
| President | | | | | Secretary | | | | |
| Vice-President | | | | | Chief Engineer | | | | |
| General Manager | | | | | Works Manager | | | | |
| Treasurer | | | | | | | | | |

Piece of the Industrial Inventory form

**Scene in offices of the Committee on Industrial Preparedness of the U. S. Naval Consulting Board showing operator at work on electric punching machine tabulating returns from the nation-wide inventory of the plants of 75,000 American manufacturers now being made by this non-partisan committee with the volunteer aid of many thousand highly educated engineers for the purpose of mobilizing our industrial resources as the backbone of the national defense.**

A London paper of May 3rd, 1916, after touching on the rôle of America in world affairs, makes the following interesting reference to the Industrial Inventory:

"Apart from the extensive naval programme which has been adopted in the United States, steps have been taken to mobilize the industrial resources of the country in the event of war. The Naval Consulting Board has undertaken to make an industrial census with a view to 'arriving at the physical capacity of the plants and their fitness and reliability for specific classes of output.' For each state, including Alaska, a board of five men has been appointed—one member being taken from each of the five leading technical societies, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, the American Chemical Society and the American Institute of Electrical Engineers. The information collected by these 49 boards will be collated by Mr. W. S. Gifford, the chief statistician of the American Telephone and Telegraph Company. The census forms will go to about 30,000 concerns during the present month. The ultimate object in view is that, in the event of war, orders for munitions and auxiliary plant may be allocated right away in such a manner as to employ the industrial resources of the country in the most efficient manner. Great Britain, with its usual lack of foresight, had to improvise all that machinery after the war. America has undoubtedly been impressed with the importance of preparedness on the engineering as well as the purely military side of war. But we may note an even more significant feature of this American move. The census is taken through the agency of engineers, working voluntarily; and its results are to be crystallized by a private individual who has been chosen for his exceptional experience in commercial statistical work. The British method is to create an army of incompetent officials, presided over by a typical civilian servant. America's compliment to its engineers and commercial men will bring enthusiasm and efficiency in a degree to which no Government department could ever attain."

The organization has been complete for some time and the Inventory is already well under way. The filled-out forms have begun to come in in large quantities, and we expect that the greater part of them will be received during the present month. We are taking every precaution in the office to see that all these reports are kept rigidly confidential. All of the employees are sworn in. Their work is carefully watched, and the room in which all of the filing and tabulating work is done is wired by an electric protective company, so that every window, door and transom is guarded at all times. Such cleaning and janitor service as is necessary is performed during office hours.

We have stated to the Secretaries of War and the Navy that while we are perfectly willing to classify the reports according to the data contained in them, we do not feel that we should be asked to assume the responsibility of stating the particular product for which any plant is best fitted. Officers of the Army and Navy have been assigned to assist in this part of the work.

This complete programme of industrial preparation is a piece of work in which the manufacturers must take a leading part. Congress cannot do it or direct it or even understand it. Most of the people in Congress are lawyers who of course know nothing of the difficulties involved in such a problem. These steps cannot be directed by the Army or Navy alone, the officers of which naturally cannot be expected to be experts in a hundred different lines of manufacturing. There are few if any Government plants which would not fail in a year if they were not Government plants. The great work of organizing the production and supply of materials for the Army and Navy must be done by some bureau or department composed largely of manufacturers, men who understand "quantity production."

At the very beginning, this body for instance will probably go to the War Department and will ask to be shown why the Army needs 17 different sizes of large guns requiring 17 different kinds of ammunition. They

(*Continued on page* 48)

# Strategic Moves of the War, June 29th, 1916

### By Our Military Expert

THE general situation in the European war appears as though developments of tremendous moment are about to arise. Now in the fourth week of the Russian offensive, practically all of Bukovina has fallen into Russian hands, each day witnessing reports of further gains on the extreme left, until the forces of the Czar actively menace Kolomea, which may be expected to fall at any moment, while it is said that the offensive is now within striking distance of the easterly passes of the Carpathians.

North of Kolki the Russians have made no progress. Indeed, it appears that no attempt has been made to gain ground here on account of the difficult terrain which extends to the Pripet.

The movement against Kovel and Vladimir-Volynski has met a decided check. This seems to have been brought about by the withdrawal of strong Teutonic forces from the main western front and from the Austrian position confronting Italy. The outcome of this necessity for dispatching troops to aid the hard-pressed Austrian line in Bukovina, Galicia and Volhynia remains to be seen, although there is evidence that at least some sort of Entente coöperation has developed by the strong Italian counterthrust which was initiated at the first sign of detachment of opposing forces.

For three days intense artillery activity has been reported along the British line. If one recalls that every enterprise of moment which has been undertaken by either side has been preceded by this powerful concentration of gunfire, the deduction that major movements are about to take place is very tempting to the observer.

Probably not until the official annals of the war are published, years hence, will the true secret of the Verdun operations be known. Despite the dispatch of at least two army corps from west to east, the threatening massing of British force behind their lines, and the incontrovertible tales of losses which have cut severely into the available reserves of Germany, the battalions of the Crown Prince continue their assaults at Verdun, seemingly with unabated fury and disregard for casualties. Whether these attacks are continued by the pure initiative of the Teutons or are necessitated, forced, by French vigor of operation, one cannot definitely tell. It seems too late for even a German success at Verdun to be of material benefit; the time seems past when such a success would severely shake the morale of France, for, with the passing months of the battle-siege and the tenacity with which General Petain's troops have clung to the position of acknowledgedly little military value, all France is reported to have taken heart, even so far as to bear up should the so-long-defended position be evacuated.

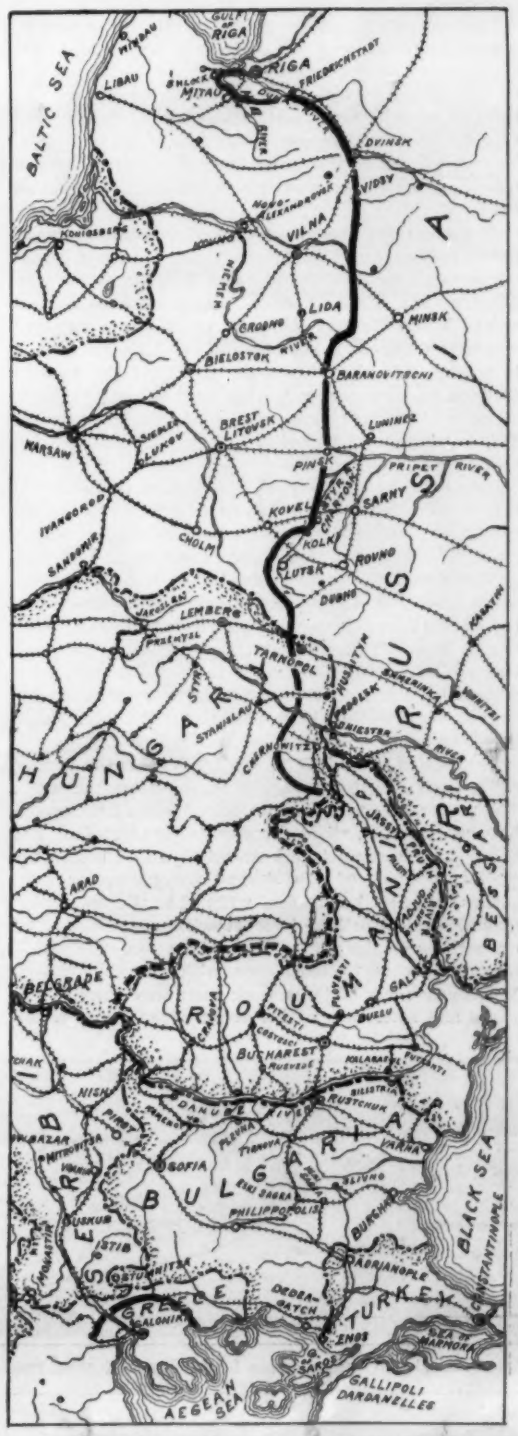
What, then, could Germany gain with tactical success at this point? A card would be placed in the Kaiser's hand, with which he could make fresh tentative offers of peace, on the plea that, with his far-flung battle lines firmly planted on enemy soil at almost every point, despite the numerical superiority of his foes, he had been able to gain his objective at Verdun; and that he could so gain any point upon which he concentrated his resources—and that further strife would achieve no result save the shedding of more blood. And the opportunity would automatically be furnished to technically shift responsibility for continuance of the war to the shoulders of the Entente.

If by any chance he could be able to not only take Verdun, but sever the French line, then there would be some possibility of far-reaching military gain and cause general retirement of the French throughout several sectors; the acquisition of the conceded territory would strengthen claims based upon geography, and the brewing great offensive might be forestalled by the necessity for consolidating other positions of defense.

There is little doubt now as to whether or not the Russian movements are other than local. Beyond a shadow of doubt it is a full-fledged offensive, and on a tremendous scale; and the delay upon the part of the British in opening their offensive may possibly find vindication in the desire to permit the withdrawal of troops before their lines, that when the hour of attack strikes there may be fewer to oppose, counting upon the ability of Russia to hold territory already gained.

In this country we get a much better and more detailed idea of the Entente movements and dispositions than of the Teutonic, for German reports are meager, and most of those which reach us pass through Entente hands, rendering themselves liable to coloring, a procedure entirely justifiable from a military standpoint when there is anything to be gained by it as, for example, the furthering of favorable neutral sentiment, resulting in at least a certain moral support. For these reasons it is absolutely necessary for a military writer to make deductions where Teutonic operations are concerned, deductions which cannot well be supported by the definite quoting of time, place and detail. The law of probabilities must govern.

From a purely military standpoint, the situation is such as to render Teutonia a trifle apprehensive, whether she is or not. Until a possible hostile development is known to be merely a bugaboo, it is to be feared; and the latest dispatches indicate a great degree of uneasiness in Berlin and Vienna over affairs




**Bearing of Russian drive on the Balkan situation**
Dotted line shows extension of battle-front should Roumania join the Allies.

in the Balkans. Greece, coerced, yielded to the demands of the Entente, and the chances for the return of ex-Premier Venizelos to power, with his well-known demand that his country actively participate in the war on the side of the Allies, are greater than ever before. When this possibility is coupled with the ominous doings round about Roumania, it is clear that the Kaiser must find no cause for pleasure in what the future may disclose. Perhaps, after all, Greece may manage to retain her fiction of neutrality, and perhaps Roumania may not strike; but, with the closing of the Bulgarian frontier against her neighbor immediately to the northward and the massing of troops near the dividing line, there is no telling what a day may bring. Roumania wants Bukovina very, very badly; and it is a matter of common belief that Russia has promised it to her as payment for active assistance. The remarkable gain which Russia has made in the clearing of the province lends a degree of reasonableness to her ability to live up to the promise. If by any achievement of diplomacy the Entente should succeed in persuading Greece and Roumania to enlist under its banner, Bulgaria's lot would be a very miserable one, for her territory lies immediately between the two, either one of which is practically or a par with Bulgaria in military strength.

Let us take a brief glance at the situation which would exist under such circumstances.

In the first place, Austria would be compelled immediately to extend her already much-weakened line something like 450 miles farther, which distance practically coincides with the Austro-Roumanian frontier. The remobilized forces of Greece would bring the strength of General Sarrail's army to almost a million men, against which Bulgaria might possibly oppose 300,000, augmented by, at most, not more than 200,000 Austrians and Germans. Without doubt Turkey has dispatched a considerable force from the defenses of the Dardanelles and Constantinople to the Macedonian front. Perhaps the combined forces of Teutonia in the Balkans might total 800,000 But when it is considered that at least a portion of these, in such hypothetical case, must be diverted to defense on the Roumanian frontier, the balance of superior strength sways heavily in favor of the Allies.

It is difficult to see how Austria could man this 450 miles which would be added to the length of her battle line. The mere fact that in her hour of great need Austria was compelled to summon not personal reserves, but German corps to her rescue, implies rather strongly the difficulty which would exist—and the heart of Hungary lies very close to the Roumanian frontier.

If such a situation should develop—and it seems by no means impossible—it is unbelievable that the Allies would refrain, ready or not, from striking their heaviest blows on every front, not merely in hopes of smashing a way through at some point, but to prevent at all costs detachment of Teutonic troops from already occupied theaters of war. The Austro-Roumanian frontier could never be left absolutely unguarded; and it would call for the throwing in of every living man in reserve and the lengthening of the existing Austrian line at the northward. Russia would never overlook such an opportunity for striking hard. This possibility of achievement leads to the belief that the inaction of General Sarrail at Saloniki is due to the hope that diplomacy will accomplish such a victory as the influencing of Roumania and Greece, in which case the blow would fall with doubled strength. Successful, it would result almost at once in elimination of Turkey and Bulgaria from among the enemies of the Entente, and should cause the retirement of the Teutonic lines into their domains proper, and upon a very real defensive.

But Greece and Roumania have not declared as yet. And it is a foregone conclusion that if the forces of the kaisers are compelled to retire, it will be with a most dangerous "sting in the tail."

## A New Expansion Joint Material for Building Construction

THERE has recently appeared a new material for the expansion joints of concrete, brick or block pavements, and building construction in general, for which several points of originality are claimed.

In the first place, the new material is a mastic which comes ready to lay in ribbon form, in a variety of widths and thicknesses. It contains no felt or paper reinforcement. A new process known as the fiber-weld process gives to the bituminous mastic the requisite cohesiveness to stand handling and storage in the ribbon form, without affecting the elasticity that is necessary for expansion requirements. It seems to possess all the elasticity of a poured bituminous joint with all the advantages of easy handling.

The material of the new expansion joint is waterproof and weatherproof, and it is said to be immune to street acids or automobile oils. It does not become brittle with age or cold weather and does not soften or run in hot weather. Its chief advantage over the usual poured bituminous joint is the elimination of heating or pouring apparatus and a great reduction of the labor item, the latter being obvious since it only requires a moment to unroll the necessary amount of ribbon, cut it, and put it in place

# The Nation's Research Laboratory

## How the Bureau of Standards is Helping Us to Do Without Europe

NO doubt the general public thinks of the Bureau of Standards as a place where academic studies are made of measures of length, weight, and the like. To be sure, the primary work of the Bureau is to standardize our weights and measures; but it is also concerned with standards of quality, which may be used by the Government in purchasing its supplies.

Time was when the purchase of materials for the use of the Federal Government was attended with no end of wrangling. Specifications were drawn up with no true conception of the qualifications requisite, and it

**Compression machine capable of exerting a pressure of ten million pounds**

was possible for unscrupulous manufacturers to underbid their competitors and supply an inferior quality of goods. Now the Bureau of Standards investigates materials that the Government needs, and has established certain standards of quality which the manufacturer must adhere to rigidly.

The work of the Bureau has expanded to such an extent that its labors range from the measurement of the radiation of stars which are absolutely invisible to the naked eye, to a study of the efficiency and capacity of a vacuum cleaner. In one section of the Bureau we find experts testing the accuracy of clinical thermometers and in another part of the same Bureau conducting a searching investigation into the best material for the joints of sewer pipes.

Every branch of the Government depends upon the Bureau for a true estimate of the qualities of its supplies, and they range all the way from typewriter ribbons to electric locomotives. This research work is of value not only to the Government, but to the country at large. Frequently, on investigating a piece of apparatus, the Bureau has suggested changes which have increased the efficiency and capacity of the product. In this way it has taught the manufacturer how he may improve his wares.

The detective work performed by experts of the Bureau of Standards has often proved a revelation to manufacturers. For instance: a man may offer the Government a certain kind of ink at a much lower price than that of other competitors and yet his bid is rejected. On inquiring the reason for its rejection, he is told that his ink will fade on exposure to daylight for a certain period of time. Surprised to learn that in a few days' test the Bureau is able to give him the life of his ink, he finds that an intensified substitute for sunlight has been employed which, in a few hours, has bleached his ink white.

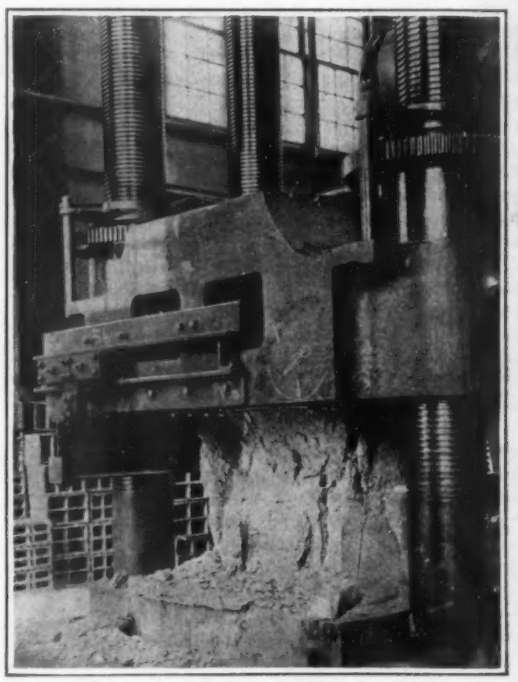
A brick manufacturer will be surprised to find that his bricks are rejected because their life is rated at only 25 years. Much to his astonishment, he learns that the Bureau has an intensified system of determining the weathering properties of brick which enables it in a few weeks' time to tell how long the brick will last before it commences to disintegrate under climatic conditions. He is thus taught something which probably he never knew before, namely that certain clays which he has been using are unfit for the making of bricks that are to be exposed to outside weather conditions.

Lessons such as these are constantly being taught. Although the work of the Bureau is done mainly for the Government its testing facilities are also employed, to an extent which has reached important proportions of late, for investigations which cannot well be performed in commercial research laboratories. No private enterprise could attempt to maintain a laboratory as well equipped as that of the Bureau of Standards.

The American Society of Civil Engineers has made use of the Bureau of Standards for the testing of building columns and bridge members. The Bureau is provided with a large precision testing machine, known as the Emery Testing Machine, which has a capacity of 2,500,000 pounds in compression and 1,250,000 pounds in tension. In the Pittsburgh branch of the Bureau there is an even larger testing machine which has a capacity of exerting a compression of 10,000,000 pounds. This has been used for estimating the strength of brick columns and reinforced concrete columns.

In the building of the Hell Gate Bridge, it was necessary to lift the side spans in order to put in the center span, and hydraulic jacks were employed for this purpose. The jacks had to support an enormous load, and no commercial laboratory was fitted with apparatus which could test them and determine their fitness for the work that they were to do. The jacks were submitted to the Bureau of Standards, where a pressure was imposed upon them equal to the load they were designed to carry. Some of the jacks were found defective, and had they been used, the result might have been a very serious disaster.

Conferences of various societies are held at the Bureau of Standards on the average of three or four per week. The writer was privileged to attend one of these conferences, recently, when a committee appointed by the Sewer Pipe Manufacturers Association laid before the ceramic chemist of the Bureau the particular difficulties that they had to deal with. The tile sewer pipe manufacturer has had to meet with a great deal of competition on the part of the metal sewer pipe manufacturer, owing to difficulties with the pipe joints. Frequently roots of trees work their way through the joints and soon clog up the sewer pipe. As it is impossible to locate the difficulty with any degree of accuracy, it is often necessary to dig up a long section of the line before the difficulty is located. It was the opinion of the tile pipe manufacturer that if plumbers could be held to a certain standard method of forming the joint, the tile pipe could be made proof against roots of trees, and then would be far more serviceable than a metal pipe. In the course of the investigation, it developed that frequently ignorant plumbers will use a mixture of clay with cement in sealing the joint, and of course such a mixture cannot be expected to endure very long. The Bureau, after listening to all



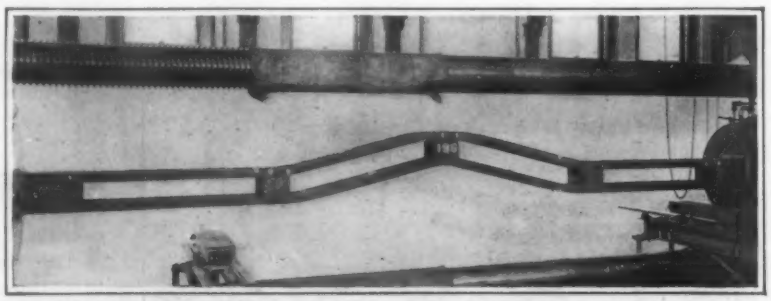
**A three-foot cube crushed in the large compression machine**

phases of the difficulty, has undertaken to make a study of the best materials and the best forms of joints, with a view to the discovery of some standard which may be demanded in the specifications for laying sewer pipes.

It was the writer's privilege to see Director Stratton, of the Bureau, go through the morning's mail. It gave an insight into the ramifications of the Bureau's work. A letter from the Panama Canal called for a report on steel rails; it was followed by a penciled scribble on a grocer's bill-head from a remote region of Idaho, asking about standard barrels. One of the largest electrical manufacturers of the country called for certain specifications of lamps; while the next letter was from the Post Office Department asking the Bureau to investigate an apparatus which appeared to be a fraud.

Just at the present time, the most interesting work of the Bureau is probably that of helping manufacturers to produce at home and out of American materials products for which heretofore they have been dependent upon foreign supplies. Recently, a spark plug was submitted to the Bureau, part of which was a porcelain sleeve made from a certain French clay. On account of the war, this spark plug could not be imported and efforts were made to produce the same material in this country. The Bureau has collected samples of clays from all parts of the country, and upon a minute microscopic examination of the porcelain in question, discovered that almost identically the same clay was to be had in a deposit in California. This was reported to the manufacturer and he is now producing a product which is fully the equal of that which was formerly imported.

The war, because it has cut off our supplies of imported clays, produced consternation in the paper industry. Large quantities of very fine clay, coming from deposits in Wales, are used as filler



**A girder distorted by compression in the Emery testing machine**

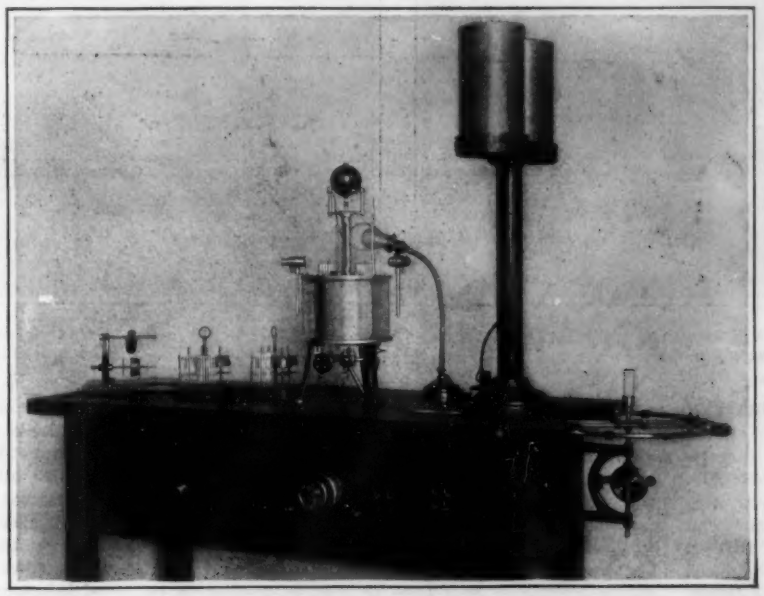
**The precision Emery testing machine**

for papers. The Bureau of Standards recently developed a system of purifying clays so that we are able to obtain the very finest of materials in this country fully equal, if not superior, to the imported material. Although this was known before the war broke out, manufacturers were loath to make a change in their raw materials, fearing that the American clay would not measure up to the European product. The war, however, has served as a whip to force manufacturers in this country to try home products. As a result, American clays are now being used extensively in the paper industry with perfect satisfaction, and when the war ends, we shall continue to use our own materials instead of importing them from abroad.

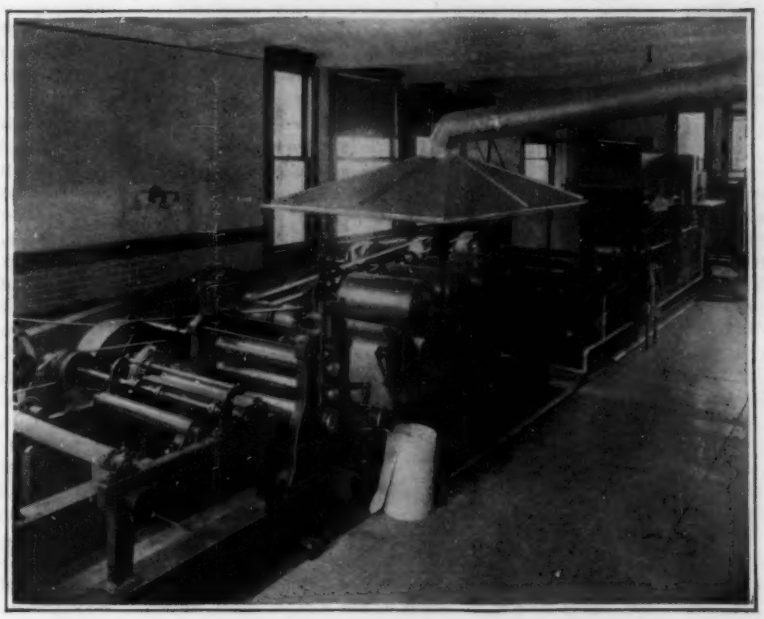
The same is true of the porcelain industry. Owing to the investigations of the Bureau of Standards American manufacturers are able to compete with the world in the production of fine porcelains. Possibly we may not be able to compete in artistic merit with the decorations used by certain foreign manufacturers, but nowhere may a finer porcelain be made than in this country.

Sometime ago, the Government realizing that we were cut off from supplies of rags and waste paper, which heretofore had been imported in large quantities, appealed to the public to save such refuse material and sell it to paper manufacturers. As a result of this appeal, a manufacturer of waxed paper asked the Department of Commerce whether any use could be made of clippings of his product. In the production of waxed paper sheets, this company is burdened with large quantities of clippings, which have been hauled away by the carload and destroyed. Owing to the association of the paraffin wax with the fiber of the paper, such clippings cannot be introduced into ordinary paper pulp. At the suggestion of the Secretary of Commerce, a bundle of these clippings was sent to the Bureau of Standards. A few weeks later the Bureau returned to the manufacturer a stick of paraffin wax which had been extracted from the clippings and a brand-new roll of paper made from the waste product. The Bureau had devised a means of manufacture which, if it proves commercially practical, will mean the saving of thousands of dollars to this company; for heretofore the company has had to cart away as much as a dozen carloads of waste clippings to be destroyed on the Newark Flats.

These are but few examples of the work that the Bureau is doing to help the country in its present stringency. Its educational work is invaluable. It has shown the manufacturer the folly of proceeding with rule-of-thumb methods. Already it has done a monumental work in bringing a closer relationship between science and the American manufacturer.



Apparatus with which clinical thermometers are tested



The Bureau's experimental paper mill

Test weight car of the Bureau of Standards, with which railroad track scales are tested

## The Death of Silvanus P. Thompson

WITH the passing away of Silvanus Philips Thompson on June 13th in London, in his sixty-sixth year, the world of science and the electrical profession in particular have sustained a great loss.

Born at York, England, on June 19th, 1851, Silvanus Thompson was educated at the Friends' School in that city. Subsequently, he studied at the Founders' College, and in 1869 graduated from London University with the degree of B. A. Having developed a preference for science rather than literature, he assumed the study of chemistry and physics at the Royal School of Mines, supplemented by visits to educational institutions on the Continent. In 1875 he graduated from the University of London as a Bachelor of Science, and three years later took the degree of Doctor of Science. In the meantime he had been engaged as lecturer in physics at the University College at Bristol, and in 1878 he was appointed professor of experimental physics. From that time onward he made important contributions to contemporaneous science. In 1885 he was elected to fill the chair of physics at the City and Technical College, at Finsbury, where he was also principal.

The investigations of Prof. Thompson were as diversified as they were important, ranging from the chromatic aberration of the eye to the design of coils in the tangent form of galvanometer. To him is credited the discovery of the curious optical illusion known as "strobic circles." He is also known for his application of the magnetic figures formed with iron filings to the illustration of electrodynamic relations and to the simplified explanation of the action of the dynamo. Among his other works are the application of Clerk Maxwell's electro-magnetic theory of light to the explanation of the behavior of tourmaline crystals, and the construction of electro-optic models of these crystals of iron, wire and glass. To him is also due the discovery that the heavy metals, such as uranium and osmium, are better emitters of Roentgen rays than metals of a lighter atomic weight.

Prof. Thompson, owing in a large measure to his earlier literary training, was probably best known by his extensive writings on electrical subjects, one of which, "Elementary Lessons in Electricity and Magnetism," has been printed in various languages. It is of interest to learn that Prof. Thompson had probably the most complete electrical library of any in private hands, including many valuable works on early magnetic studies. Among the many scientific societies to which he belonged, Prof. Thompson's name appears as an honorary member of the American Society of Electrical Engineers.

## Rust-Proofing Process for Treating Cast and Wrought Iron and Steel

THERE has recently been invented by Augusto Bontempi, an Italian chemist, a process of rust-proofing which is reported to consist in the oxidizing of cast and wright iron and steel pieces used in structural work of all kinds, thus rendering them immune to the corrosive action of the atmosphere, of water, and of sulfurous and other gases for a practically unlimited period.

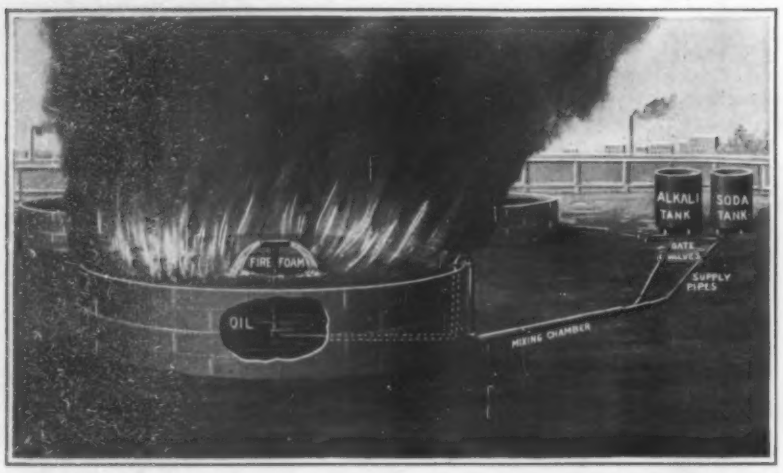
The pieces to be treated are first cleaned by means of emery paper or by sand-blasting. They are then placed on a form of steel-wire cage, which is then driven inside an airtight muffle that has been previously heated by means of gas jets. When the muffle has been closed in front, after the insertion of the pieces to be treated, superheated steam is delivered inside the muffle with the object of preparing the surfaces of the pieces for the subsequent action of chemical fumes. After the pieces have been subjected to the action of the superheated steam for about 30 minutes, the delivery of steam is shut off and the chemical substance, in the form of a powder, is placed in a separate retort at the back of the muffle. The retort is heated separately, also by gas jets, and the fumes from the chemical powder enter the muffle under pressure and give the pieces under treatment a protective coating of oxide. On the gage being removed from the muffle it is covered by a casing to allow of the gradual cooling of the pieces.

The pieces on being removed from the muffle are of a light gray color, and in that state they are practically non-corrosive in any medium. However, while still hot they are dipped in oil in order to render them more attractive by taking on a rich, blue-black color. If required, the pieces can be painted, in which instance it is claimed that the paint will adhere more readily than on non-treated material. The chemical used is non-poisonous and non-explosive.

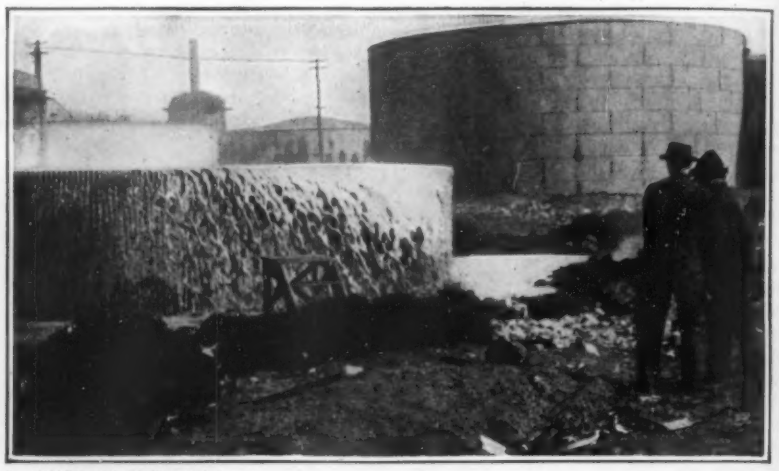
## British Use of Nicotine Products

NICOTINE preparations are used to some extent in Bradford, England, by nurserymen and others, and their supplies are obtained from other centers, mainly London, Bristol, and Liverpool. They are used in cake form for fumigating under cover, also as a liquid for spraying, both indoors and outdoors. The liquid is put up in sealed bottles and tins. A government license is required by vendors, as it comes under the poisons act, and it is under government inspection and control as in the case of petrol or gasoline.

Inquiries have been made at Bradford, the seat of the British wool industry, as to the treatment adopted in the washing or dipping of sheep. It has been learned that nicotine preparations are not now used in England as a sheep dip. It has been found from past experience that their use has a tendency to stain the wool more or less, according to the strength of the preparation, and in their place a powder, or carbolic liquid, is used in the dips. Of the two, the powder which consists of arsenic and sulphur is preferred.




Principle of the installation of the "fire-foam" extinguisher, depicting the arrangement of piping and supply tanks



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The aftermath of the action of "fire-foam," showing the residue on the sides of the experimental tanks

## Extinguishing Oil Tank Fires with a Blanket of Foam

WHERE huge quantities of oil are stored there is a constant danger of conflagration. Until quite recently the fire menace presented a most serious problem to large oil companies, for only a spark is sufficient to convert a placid lake of oil into a fiery furnace in a few moments' time, which cannot be extinguished by ordinary means because the combustible is a liquid.

There is only one effective way to extinguish an oil fire and that is to smother it; in other words, to cover the burning oil with a suitable form of blanket that will completely cut off the supply of oxygen which is essential to combustion. If this can be accomplished, the flames soon are extinguished. The problem of the oil companies has therefore been to produce a suitable kind of blanket that could be readily and expeditiously handled.

In the protection of its oil tanks against conflagration the Standard Oil Company of California developed a liquid extinguisher which it called "fire foam." In reality, fire foam consists of two separate liquors which, when mixed together, form a thick spume which readily spreads over a wide area and effectively shuts off the oxygen supply of the burning oil. Quite obviously the two liquors must be separately stored and only brought together just prior to the time when the foam blanket is desired in a blazing tank. One of the liquors is of an alkaline nature, while the other contains soda; and Greek licorice is used as the bond which combines the two.

For the purpose of ascertaining the effectiveness of fire foam, the Standard Oil Company of New York recently staged a spectacular and highly interesting test at its works in Greenpoint, New York city. For the demonstration an open tank of about 35 feet in diameter was chosen. A liberal supply of a very volatile blueish oil was placed in the tank for the purposes of the test.

Up through the center of the tank was placed an upright pipe, capped with a T-fitting serving as two opposed outlets. Connected to this pipe was a long, heavy pipe serving in the capacity of a mixing chamber for the two liquors of the fire foam. The liquors, contained in separate tanks, were led through gate valves into the mixing chamber, as shown in the accompanying wash drawing. The large pipe, being at least 100 feet in length, gave the two liquors ample time to form a thick foam which poured out from the two openings of the T-head in the center of the tank.

How little is really required to start a serious oil fire was amply demonstrated at this test. The tank of oil was set afire by igniting a piece of cotton waste previously soaked with oil and throwing it into the large container. A few moments later the fire had spread over the entire surface of the oil and the flames were rising to a height of perhaps several hundred feet, accompanied by huge clouds of black smoke. So intense was the heat emitted by the conflagration that the observers, standing on a wooden platform some 100 feet away, were obliged to abandon their post and seek refuge by moving back 50 feet or more; and it is well to mention that the wind was blowing but slightly and in the opposite direction. It appeared quite dubious indeed that any human agency could successfully combat the fire—at least to the layman.

The fire foam liquors were then allowed to run through the mixing pipe and into the tank, issuing from the outlets in the form of a thick liquid of creamy appearance. The foam rapidly spread out over the surface of the blazing oil, bubbling as would a huge cauldron of dense, boiling liquid. Here and there the flames were seen to reduce in size, eventually to be smothered entirely as the foam blanket became more dense. In a period close on to a minute the fire was completely extinguished, permitting the observers to approach and study the aftermath.

All the tanks of the Standard Oil Company of New York are provided with fire-foam connections, and in this manner the fire menace has been reduced to a great extent. And to minimize the conflagration risk still further, the company has installed a system for automatically introducing fire foam should fire break out at any time; hence the human element is entirely eliminated and the vigilance of the watchman is no longer a factor. Briefly, if an oil tank catches fire the heat immediately melts a fusible connection, which releases controlling valves of the supply source of the fire foam which then flows into the blazing tank and smothers the flames.

## Three-Mile Concrete Causeway Which Saves Thirty Miles of Travel

THE thousands of automobiles and other vehicles traveling daily between Sacramento and the San Francisco Bay cities, in California, are saved 30 miles of travel each way by the completion of a three-mile, concrete causeway, bridging the treacherous Yolo Basin. The causeway starts at Sacramento and extends to the town of Davis. It was built by the State, through its Highway Commission, at a cost of approximately $400,000. It is 20 feet in height at the highest point, allows for a roadway 21 feet in the clear, and is 16,310 feet, or 3.9 miles, in length. About one seventh of the construction, constituting what may be called the approaches, is of wooden materials. The piles are of pre-cast concrete, while pre-cast concrete slabs, resting side by side, span the space between the bents. The ornamental coping is of concrete. This causeway is declared to be the most notable of the kind in the world.

## The Current Supplement

ALTHOUGH the idea is by no means new, it has taken a great war to impress upon the world the illogical manner in which the hours of daylight are utilized, or rather wasted, and to induce the radical change that has recently been made in several European countries, although the manner of effecting this change is somewhat childish. The article on *Saving Daylight*, in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2114, for July 8, surveys the history, reasons and arguments in relation to the subject comprehensively and informingly. *Aerography* tells us something of the science of the structure of the atmosphere, a subject to which but slight attention was paid before the vogue of the aeroplane. It is accompanied by diagrammatic illustrations. *Medieval Universities* tells of the revival of learning in Europe, and of some of the curious customs and disciplinary measures that prevailed in the ancient institutions of learning. A description of *The Duilio* concerns a magnificent steamship recently built in Italy that shows how that country promotes her trade relations with South America. There are a number of excellent illustrations showing prominent features of this vessel. *The Principles of Crop Production* is rather a long article, reviewing early theories, and giving the results of extensive modern investigations, but the subject is one of such importance that it will be appreciated by the layman as well as those interested in agriculture. It is illustrated by a number of diagrams. The article on *Color Vision* includes color-vision theories and the theory of vision and among other things gives valuable information in relation to color blindness. Other readable articles in this issue are *The Misuse of Drainage Systems as Sanitary Sewers; Antimony and the War* and *American Flags*, which tells about the valuable collection in the National Museum of different flags that have been used in this country.

## Use of Brier Roots in the Making of Pipes

BRIER pipes, made from the roots of the French white heath (*Erica arborea*) were first introduced into England in 1859. The plant flourishes in all countries bordering upon the Mediterranean and grows to a height of 38 to 45 inches. In the vicinity of Florence, Italy, it is the custom to cut the long, tough, young shoots each year, bind them together, and sell them for use in sweeping streets in cities and towns. Outside of this, the plant is allowed to grow for three or four years, when the roots will have developed sufficiently to permit cutting them, enough of the plant being left to permit cuttings every three years.

The roots most in demand for pipe making—a certain aroma and brightness of wood being the test—are those obtained from the Tuscan Maremme, in the neighborhood of Follonica, Cecina, and Grosseto, Italy. They are preferred by manufacturers to those from any other part of Italy, or from Algeria or the Orient. Most of the land in the Tuscan Maremme growing these roots is owned by French and British concerns, which maintain warehouses and workshops on or near their lands where the roots are washed, boiled, and roughly shaped, after which they are sorted by size, color and quality. They are then shipped from these warehouses as occasion demands to France, Great Britain, and, before the war, Germany, where they are made into pipes known to commerce.

Concrete causeway which bridges the treacherous Yolo Basin in California

# Inventions New and Interesting

## Simple Patent Law; Patent Office News; Notes on Trademarks

### A Combination Telephone Directory and Antiseptic Mouthpiece

IN a little metal box that fits over the mouthpiece of the ordinary telephone instrument, Edward A. Dieterich, an inventor of New York city, has succeeded in combining a handy telephone directory and an antiseptic protector.

The telephone directory member consists of a strip of glazed linen which winds on a spring-operated roller. When the user desires to look up a number on the directory, the curtain is pulled out; and when its purpose has been served, the curtain is released, automatically returning it to the roller within the case. Sufficient room is provided on the front side of the curtain for over 50 telephone numbers, and if it were found necessary to include more names in the directory the length of the curtain could readily be increased.

The major portion of the space within the metal case is taken up by the antiseptic protector member; in fact, the device was originally intended as an antiseptic protector only, the directory being a later addition. In the insert drawing is shown the arrangement of Mr. Dieterich's earlier model. It will be noted that the protector consists of an endless web of canvas, silk, paper, or other suitable material; two perforated rollers which serve to hold the web and drive it by means of sprocket teeth engaging in holes along the sides of the web; a rotary brush which applies antiseptic powder on the face of the web; and two small rollers acting as idlers, and a knob for turning one of the perforated rollers which in turn moves the web. The perforated rollers are provided with sliding doors at their ends so that perfumes or antiseptic preparations may be introduced inside of them. As the knob is turned, a fresh surface of the web continues to be presented to the opening of the mouthpiece.

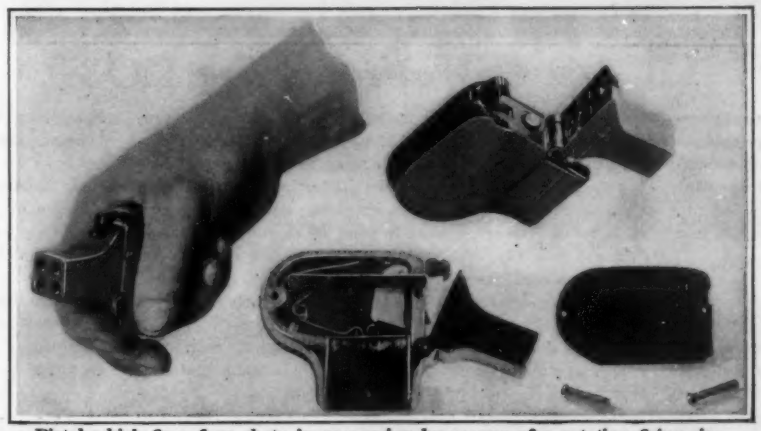
In a more recent model the inventor has materially simplified the antiseptic protector. A small trough for holding the antiseptic powder or liquid is provided at the bottom of the device, and into it dips the rotary brush which applies the powder or liquid to the web. By putting the proper tension on the idlers, the sprocket teeth and holes have been done away with. The casing is made in the form of a box with a hinged lid, so that the mechanism proper, mounted on a substantial framework, may be removed from the casing, to place the device on the transmitter of a telephone instrument. It is held in place by the mouthpiece of the telephone, which is screwed into place from within the casing.

A telephone antiseptic mouthpiece and handy directory combined in one device

### A Four-Shot Pistol That is Operated by the Rotation of the Firing-Pin

CONSISTING of four pistols in one, a weapon of extreme compactness has been invented by Cornelius Vanderbilt, Jr., of New York city. The pistol, because of its small size, is adapted to be carried conveniently and inconspicuously in the pocket of the user, for the purpose of self-protection. It is claimed to be simple and inexpensive in construction, and at the same time, effective and reliable in operation. But the paramount feature of the weapon is that the hammer-actuating trigger is so designed that practically the entire pistol may be grasped in the palm of the hand when in use, thus minimizing the effect of the recoil upon the hand and upon the position of the pistol, and insuring greater accuracy of aim; furthermore, the pistol is almost entirely concealed.

The diminutive pistol consists of two main parts: the front member, which contains the individual barrels and bullet chambers, and the main member, which contains the trigger and firing-pin mechanism, and serves as the part which is grasped in the palm of the hand. To load the pistol, a latch at the forward end of the stock is raised, releasing the barrel or front member which swings downward on its hinge, bringing to view the bullet chambers. After the bullets have been inserted, the barrel member is returned to its normal position, in which it is locked by the latch.

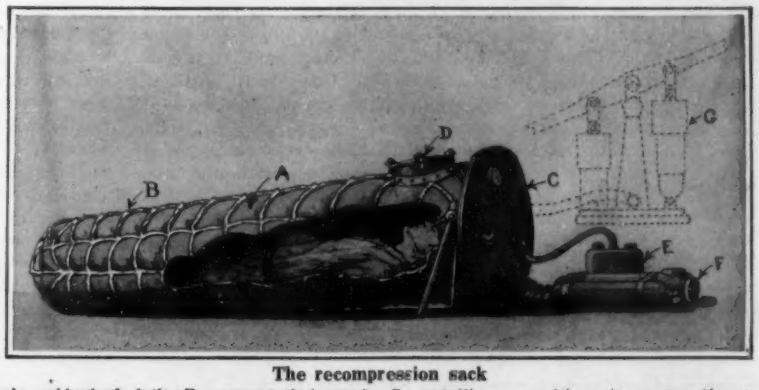


Pistol which fires four shots in succession by means of a rotating firing-pin

The firing of the barrels in successive order is accomplished by a common firing-pin, which is arranged to rotate on its axis so as to bring an eccentric projection, formed by slanting or beveling the face of the pin, into consecutive contact with each shell. Obviously, the bases of the cartridges are closely placed together, so that the pin in rotating brings its projection over a portion of each base.

The trigger of the pistol consists of a sliding member on the under side of the stock, which is actuated by pulling it upwards with the movement of the second finger, the pistol, of course, being held in the palm of the hand all the while. The upward movement of the trigger causes the firing pin to be rotated so that the projection comes in line with a new cartridge; and toward the end of the trigger movement a hammer member, which, meanwhile, has been pushed back steadily against the tension of a spring and away from the firing pin, is suddenly released. As a result, the hammer is violently thrown back on the firing pin with sufficient force to cause the latter to explode the cartridge. Two long, spring-pressed pawls are used in transferring the upward movement of the trigger to the rotating pin and the hammer. The first pawl engages with ratchet teeth on the rear end of the firing pin, while the second pawl coöperates with a notch in the hammer during the greater part of the upward movement until a sufficient distance has been established between hammer and firing pin, further movement causing the pawl to slip out of the notch, followed by the release of the hammer.

Any suitable means may be employed for extracting the shells from the barrels after they have been discharged. The inventor has found it convenient to use an extractor consisting of a strip of steel, with a small, right-angle bend near one end. When not in use the extractor is carried between the stock frame and one of the side plates, a notch being provided at the forward end of the stock for this purpose.




The recompression sack

A—rubberized cloth; B—covered chain mesh; C—metallic cover with various connections; D—glazed observation port; E, E and F—self-contained air supply and air regenerating system; G—separate pumping plant and hose connection which may be used instead of the self-contained equipment shown.

The self-contained diving suit converted into a recompression chamber

A—air pressure supply belonging to the suit; B and D—regenerative cylinder and oxygen flask, respectively; C—telephone connection and life line combined.

### Novel Hospital Locks

EFFECTIVE use of the time under water, combined with the safety of the diver, has been found to depend, so far as the man's physical welfare is concerned, principally upon the way in which he is recompressed and then decompressed in the hospital lock. Broadly, the same conditions prevail in dealing with men that have worked under compressed air in the sinking of foundations and kindred undertakings in water-soaked ground. The aim, of course, is to prevent the formation of bubbles of nitrogen within the body and the circulatory system of the blood.

In deep diving, the man in the suit spends a disproportionate part of his time under water in returning to the surface and in undergoing slow decompression. During this period he calls for the services of four or five men and is, himself, uselessly suspended in the water at a point somewhere between the surface and 50 feet down. The cost of labor is a heavy one, and the man is having his energies sapped by his confinement in his suit and possibly by the water, if it be cold. To reduce these outlays to a minimum and to provide a practical and economical substitute for the decidedly expensive hospital lock, the Germans have lately developed two facilities—they can hardly be called apparatus—of an efficient sort. The first form of the outfit makes the diver's suit a self-contained recompression and decompression chamber by the employment of a mesh work of small steel chain covered with cloth. The second equipment is somewhat more ambitious and of wider applicability.

Many of the up-to-date German diving dresses are of the so-called self-contained type. That is, the man draws his air from reservoirs carried upon his back and chest—the exhaled air being cleansed and

revitalized for further service by means of a regenerative attachment. In suits of this character the entire body is covered —the hands even are encased in gloves that form an integral part of the dress. Therefore, when the submarine armor is inflated every portion of the body is subjected to the same measure of compression. To prevent rupturing the suit when not under water and when being used to recompress the man after he has been brought aboard the salvage craft, etc., the chain mesh is pulled over the elastic parts of the dress and serves to effectually reinforce them against the bursting stress of the air within. In self-contained suits, it is thus made possible to bring the man quickly to the surface and not leave him dangling under water during the period of decompression. As soon as he has reached the deck, the suit's own air supply system is used to effect prompt recompression, and then only one attendant is needed to supervise the recompression and the subsequent decompression. The encased diver can be made comfortable the while.

To take care of men wearing either self-contained or the usual form of diving dress where the air is supplied by hose from the surface, a recompression sack of rubberized cloth is provided. This sack is strengthened by covered chain mesh and has an annular metal collar to which a cover of bronze is secured air-tight by suitable bolts. The pressure air can be furnished either by the regenerative outfit of a self-contained suit or by any form of acceptable air pump. To facilitate observation, the sack has a glazed port which is uppermost when the outfit is in service and the diver is resting prone within. The dimensions of the sack are ample enough to take a diver with his suit on but with his helmet open so that the air can reach the lungs. Ordinarily, the cumbersome suit is removed to make him more comfortable while undergoing recompression and subsequent decompression. These sacks are virtually individual hospital locks; are compact and can be stowed away folded up, and are relatively inexpensive. When in use but one attendant is required.

In extensive subaqueous undertakings, where the men are coming out of the water or out of the air-lock in numbers and at irregular intervals, the hospital lock is not satisfactory, because those inside must be treated as a group and not with regard to their individual physical needs. The recompression sack, on the other hand, makes it entirely feasible to handle each case separately and to deal with the man at once. Because of its form the recompression sack is both light and portable and can be moved to any point where needed. More than that, this protective outfit can be made available on any sort of salvage craft or elsewhere where a regular hospital lock would be out of the question.

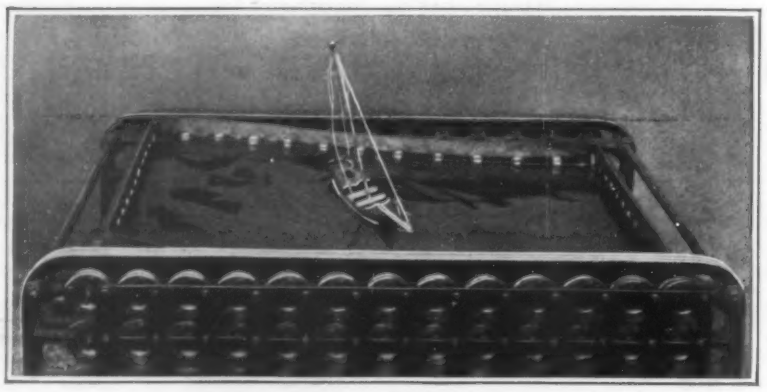
## A Wave-Producing Tank

### Italian Naval Officer Perfects Device for Studying Wave Motion on an Experimental Basis

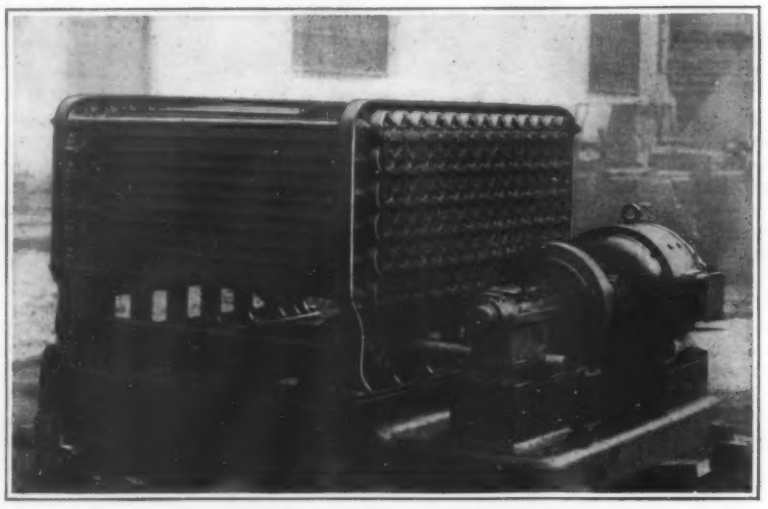
IN our issue of December 6th, 1902, we gave an account of the "navi-pendulum" designed by Col. (then Capt.) G. Russo, of the Royal Italian Navy, to facilitate study of the oscillation of ships under the influence of the waves. This device made no attempt to reproduce the waves themselves; it merely reproduces, in a pendulum-like device, and by means of certain complicated adjustments, oscillations corresponding to those of a given vessel under given conditions. Col. Russo now sends us descriptions and photographs of a wave-producing tank which he has recently built and successfully tried out, and which marks an even more signified step in the reduction of the study of ship movements from a basis of theoretical mathematics to one of experiment and demonstration.

The possibility of reproducing, within a restricted space, any desired wave-motion depends upon the fact that in the motion of the sea, when unaffected by disturbing causes, only the undulated profile of the wave advances horizontally, the particles of water themselves merely describing, at uniform velocity, a circular orbit in a vertical plane perpendicular to the line of the crests and hollows, and making a complete revolution in this orbit in each period of the wave. Likewise if the attention be fixed upon any definite region, the mass of water of that region taken as a whole has a perfectly definite motion, changing its shape constantly, to be sure, but retaining at all times its continuity, and returning at stated intervals to its initial shape and position.

If we visualize the bounding surfaces of such a mass of water, thinking of them as thin sheets of some elastic material, they will be seen to follow all the changes in shape of the mass. And if we could isolate this body of water, with its bounding sheets, not only would the same thing hold, but its converse also; *i. e.*, if, with the water at rest, a definite series of movements were induced in the walls, there would occur in the water the appropriate wave-motion.



Experiment under way in wave-producing tank



External appearance of wave-producing tank

In constructing an artificial wave-producing tank in accordance with these ideas Col. Russo had a two-fold problem to deal with: to build a tank whose walls would have the necessary flexibility to permit of all desired distortions, and to determine the qualitative and quantitative relations between the type and the measured value of the distortions, and the period, length and amplitude of the corresponding waves.

These problems he has solved. He has built a tank 47 x 39 inches, 19 2-3 inches in depth. The walls are of rubber, the ends and bottom supported by a series of parallel bars. By an elaborate mechanism these bars are given an orbital revolution about axes parallel to themselves. This creates an undulatory motion of the entire end and bottom walls, which induces wave motion of the water in the tank. The apparatus can be made to generate waves of any desired length up to 12 feet, and varying in amplitude from 0 to 3½ inches. Of course, in using long waves, the entire wave-length does not appear in the tank at once; compare the illustration.

This tank was first tried out on February 24th, 1916, under direction of the Italian Ministry of Marine, with very satisfactory results. Col. Russo plans the construction of a much larger tank, in which experiments of great importance may be conducted.

## A Metal Socket Which Acts as a Hand in Driving a Car

THE ingenuity that is being displayed in equipping with artificial limbs the European war's maimed is so general that it has become commonplace. Men who leave the battlefields in a condition that would seem hopeless as far as their future utility is concerned are found but a short time later performing all manner of tasks with ingeniously constructed arms, hands and legs. So it is that only the most unusual cases attract passing attention now, and such is the one depicted in the accompanying illustration.

A well-known French driver lost his right arm in battle and to all intents it seemed at the time that he would never again be able to drive an automobile; at

(*Concluded on page* 49)

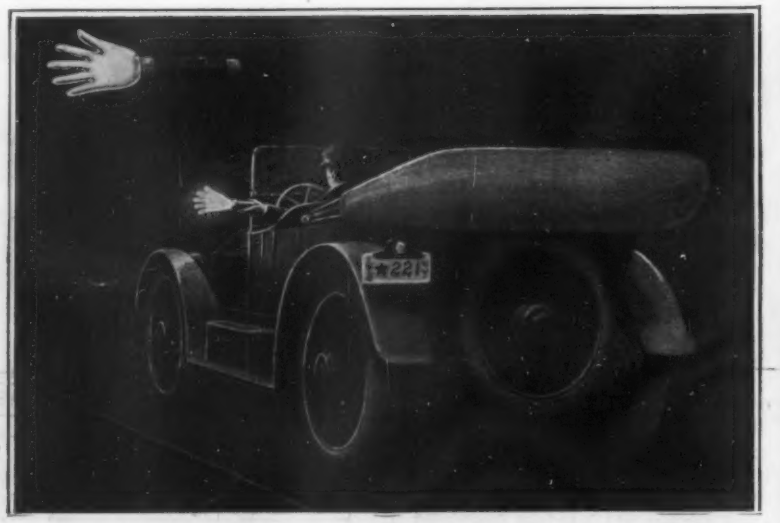
## An Illuminated Celluloid Hand for Automobile Signaling

SAFETY in night driving is essential to real enjoyment, and to promote this some means of positive and sure night signaling seems to be necessary. There have been all sorts of mechanisms consisting of arrows, lights, swinging indicators, etc., proposed and invented, but none has come into use to any great extent because of their being so different than the usual method of day signaling with the hand. Taking a left-hand drive car the holding out of the left hand is universally and quickly recognized as a signal for a turn to the left, while holding the hand straight up is known to be the signal for a stop or a turn to the right.

A Milwaukee motorist noting how simple day

(*Concluded on page* 50)

A well-known French driver who, despite the loss of an arm in battle, still drives a car with his old-time dexterity



Illuminated hand, made of translucent celluloid and placed over an ordinary pocket flashlight, used as a night automobile signal

## RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

### Pertaining to Apparel

ATTACHMENT MEANS FOR GLOVE FASTENERS.—W. S. SILVERNAIL. Address W. A. MacDonald, Masonic Bldg., Gloversville, N. Y. This invention provides attachment means in the nature of a washer made of leather, felt or other suitable tough, flexible material, carrying on one face or side thereof a layer of soft glue which renders the washer always ready for application to the leather or textile of the glove, and which soft glue, under the pressure of the fastener which is applied to the glove in any usual manner, serves to secure the washer firmly to the glove.

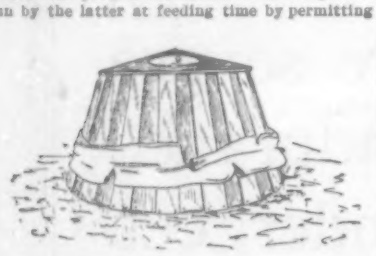
EMBROIDERED FABRIC.—L. SCHWARTZ, 35 White St., New York, N. Y. This invention provides a fabric having united sections, the connecting seam being concealed by embroidery incorporated in a general ornamental design; and provides a seamed fabric with ornamentation embodying a continuous solid portion covering said seam. The fabric is particularly employed in making women's skirts.

KNEE PAD.—E. ASHTON, Waco, Tex. An object here is to provide a simple, strong and inexpensive knee protector which when worn will not inconvenience the wearer when standing or walking. It provides a knee protector in which the pad for the knee is yieldingly suspended within the shoe of the protector.

NECKTIE.—I. LEWIN, 462 Broadway, New York, N. Y. The invention relates to woven neckties, and provides a necktie which is highly ornamental and reinforced at the front. To accomplish the desired result use is made of a flat tubular body and an ornamental reinforcing strip overlying the front of the said body and having its side edges integral with the said body front.

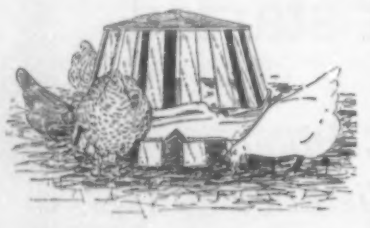
### Of Interest to Farmers

CHICKEN COP.—W. I. HALDEMAN, 76 Main St., Pine Grove, Pa. This invention relates to coops for housing chicks and chickens, and one of the main objects is to provide a coop which will protect the former from being overrun by the latter at feeding time by permitting



CLOSED CHICKEN COOP AND DISINFECTING DEVICE

the chicks to enter the coop bodily to feed, but bodily excluding the chickens although permitting the entrance of their heads and necks. Mr. Haldeman has also invented a chicken-disinfecting device. This invention relates to the care of chickens and other fowl, and the main object thereof is the provision of means



OPEN CHICKEN COOP WITH DISINFECTING DEVICE IN OPERATION

for automatically disinfecting the chickens while feeding or for chicks, while running into and out of a coop. The coop may be made in various sizes and shapes. It prevents the entrance of animals and may be used to segregate and to feed either chicks, cockerels, hens, roosters, etc.

COUNTERBALANCING DEVICE.—D. B. JACOBS, 6010 Normal Ave., New York, N. Y. This invention provides a device arranged to relieve the attendant in charge of the harvester from paying constant attention to the position of the elevator relative to the wagon into which the grain is discharged by the elevator, and to prevent the elevator from dropping suddenly and injuring the harvester in case the wagon moves accidentally or purposely out from under the elevator.

APPLIANCES FOR REMOVING COMB-FRAMES FROM BEEHIVES.—F. C. ROSS, Box 194, Onawa, Iowa. As is well known, it is the usual practice for apiarists to remove comb-frames from beehives manually, which involves more or less danger of attack from the irate bees. This invention is an appliance which is adapted to be used conveniently and safely for this purpose.

PEA HARVESTER.—T. B. GRAY. Address J. W. Hough, 201 E. Plume St., Norfolk, Va. This improvement provides an easily operated machine especially adapted to remove the pods and the peas from the plants in the field without disturbing the vines, and provides a mechanism for cleaning the peas and for separating them from the broken leaves, pods and the like, and for finally discharging them in condition for the market.

### Of General Interest

BEER TAP.—A. GOETZ, 492 2d Ave., New York, N. Y. This invention provides a tap with means for closing the movable member preliminary to separating it from the stationary member of said tap; provides a draw-off pipe with a closable key valve adapted to open the draw-off valve of a tap, said key valve being arranged for closure as a preliminary to the closing of the draw-off valve; provides a handle-like pipe connecting extension for the movable member of said key valve; and provides a pressure-supply pipe and a liquid-delivering pipe with means for automatically opening and closing the same when connecting to or disconnecting from the liquid supply.

SAFETY BOTTLE.—O. S. HASLETT, 25 Lexington Ave., Jersey City, N. J. The inventor provides a safety closure or stopper for bottles used especially for containing poisons or other dangerous materials, and whereby a person will be prevented from accidentally opening the bottle and partaking of any of the contents thereof under the mistake or misapprehension that he is taking something else.

PERPETUAL CALENDAR.—G. V. HOUSE, 136 Park Ave., Mount Vernon, N. Y. The calendar is arranged to permit the user to set it for a whole month of any year in any century under both the Julian and Gregorian systems, displaying the name of the month, the number of days in the month and the names of the week days, and when set for any one month of a year the calendar can be readily adjusted for any other month of that year.

HIGH VELOCITY SHELL OR PROJECTILE.—S. D. SIMMONS, 4228 Park Ave., Bronx, New York, N. Y. The invention provides a compound shell which comprises a body that has a rifled bore and a chamber, which latter contains an explosive for projecting a shell that is held in the rifle bore, the firing of the explosive being effected by a time fuse, so that the shell as a whole can be fired out of a gun of standard construction, and when the shell has attained a predetermined point in its flight the explosive charge therein is automatically fired and projects the smaller shell at very high velocity, which is the sum of the velocity of the body at the time of explosion of the charge therein plus the velocity due to explosion of the explosive charge in the shell.

### Machines and Mechanical Devices

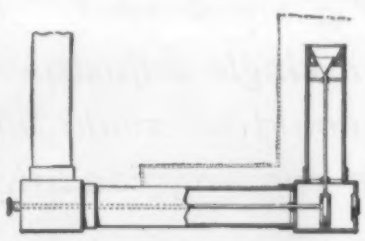
FEED INTERRUPTING MECHANISM.—A. BROADMEYER. Address The Hickok Mfg. Co., Harrisburg, Pa. The primary object here is to provide means for automatically interrupting the feed of the paper when more than a single sheet is moved from the stack at one time, and to do this by breaking the driving connections through the positive action of means directly controlled by the paper being fed.

TABLE ADJUSTING MECHANISM FOR PAPER FEEDING MACHINES.—A. BROADMEYER. Address The Hickok Mfg. Co., Harrisburg, Pa. This invention provides a table adjusting mechanism which will operate with equal facility, accuracy, and general effectiveness in connection with rough, smooth, thick, or thin paper, and to do this automatically, imparting a step by step upward movement to the table in order to maintain its paper stock at practically a constant level.

COPY HOLDER ATTACHMENT FOR TYPE WRITERS.—W. E. GRAY. Address Bartels, Blood and Bandroph, 728 A. C. Foster Bldg., Denver, Colo. This improvement relates more particularly to means which provide for indicating upon the copy the spacing of various kinds done upon the typewriter; that is to say, when the typewriter is actuated for the purpose of letter spacing or line spacing, an indication (corresponding to the changed condition of the typewriter due to such spacing), is made upon the copy holder.

### Prime Movers and Their Accessories

DRAFT REGULATOR.—R. L. SPURLIN, 111 E. Palm Ave., Tampa, Fla. This invention is an improvement in steam boilers and provides a device which may be mounted in the smoke



DRAFT REGULATOR

stack or funnel of the boiler and connected to a suitable source of steam supply, the device including an adjustable valve adapted, in conjunction with other parts, to create and regulate a jet of steam in the stack or funnel calculated to produce a draft of variable intensity.

RAIL JOINT.—W. J. SMITH, Grand Hotel, Bessemer, Ala. The mechanism provided securely joins the meeting ends of the rails without the use of bolts or the like passing transversely of the rail, and without the necessity of transverse openings in the rails or the joining means, and wherein the mechanism is arranged to support the meeting ends of the rails in true alinement, and against the possibility of lateral or vertical movement with respect to each other, and without interfering with the movement of expansion and contraction due to temperature changes.

### Railways and their Accessories

SAFETY WATER GAGE.—E. M. WALKER, 719 Lami St., St. Louis, Mo. This invention relates more particularly to a gage adapted

SAFETY WATER GAGE.

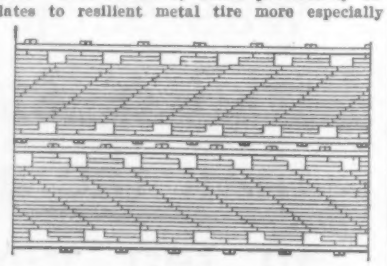
for use in connection with a locomotive boiler to indicate the height of the water therein. It provides a gage consisting of a plurality of oppositely disposed pairs of glasses arranged at opposite ends of the cylindrical chambers of the gage, whereby the height of the water may be viewed from either side of the gage, the construction being such that a particularly strong and safe method of mounting the glasses is provided.

### Pertaining to Recreation

NURSERY RATTLE.—AMELIA MORSE, care of Nursery Novelties, 32 Union Square, New York, N. Y. The invention relates particularly to playthings for small children. Among the objects is to provide a nursery rattle having sounding features to attract the ear of the child, and relatively movable figured parts to attract and more or less educate the eye of the child.

### Pertaining to Vehicles

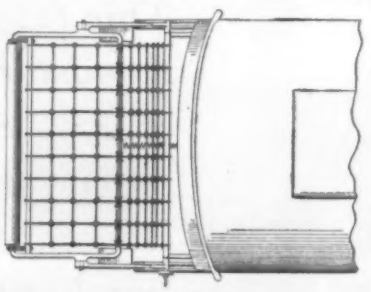
VEHICLE TIRE.—C. C. POWERS, Williams, Ariz. This invention, which particularly relates to resilient metal tire more especially



VEHICLE TIRE

adapted for motor and other heavy vehicles, primarily has for its object the provision of an improved tire of the general character stated that can be manufactured at a comparatively low cost, that may be easily assembled and readily repaired, and by the employment of which the troubles incident in the use of pneumatic tires are avoided.

VEHICLE TENDER.—A. J. DUFFY, 1504 Esplanade Ave., New Orleans, La. The inventor provides an automatic fender having



VEHICLE FENDER

a pivoted net or apron supporting frame adapted to tilt upon an object being deposited thereon into position for retaining the object out of contact with the ground. It provides a fender having a roller arranged at its forward portion adapted to be set into operation when the fender is lowered whereby to rotate for moving an object which has been engaged by the fender upon the tilting apron.

TIRE.—J. THOMSON and E. L. PRATT, Syracuse, Neb. In this tire the internal resistance increases with the external pressure. It is puncture and blow-out proof, and even were the layers pierced, the cork filling would, by its expansion, prevent any opening being formed. The resiliency of the tire does not depend upon the air space altogether.

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NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

## America's Industrial Organization for National Defense

(*Continued from page 40*)

will ask if that number cannot be reduced—if there are not, as in millinery, some styles of artillery that may be discarded as out of date. This body will inquire of the military authorities whether our specifications and design of shrapnel cannot be changed as some of the foreign shells have been changed, at the suggestion of our manufacturers, with enormous reduction in cost, increased output and improved efficiency. They will consult all those concerns which have been producing munitions and will preserve their experience while it is still fresh.

This body—we may term it the Bureau of Munitions—will furnish to manufacturers all the necessary specifications, samples, jigs, gages, drawings and other information, and will ask each one of them to accept at regular intervals small orders for that kind of material that he could best produce for the nation's defense. These orders, whether for 50 shells or a hundred blankets or a thousand small fuse parts, would be placed with each producer regularly every year. He would thus learn where to obtain the necessary raw materials, how to produce the articles, and how they should be billed and shipped. The order, while carrying a reasonable percentage of profit, would be too small and too special to be in itself considered as desirable business, but it would keep the manufacturer's hand in, and the small amount of trouble involved would be spent no more grudgingly than the inspection that he regularly bestows upon, say, his automatic sprinkler system. The cases are indeed parallel, for such effort would be for war prevention rather than for war insurance. Insurance indemnifies after the disaster. Nothing can indemnify a country for the loss caused by war. War must be prevented, and it can be, by scientific preparation in days of peace.

It is folly to think—and there is no danger of manufacturers making that mistake—that it will be a short and simple matter to instruct our industries how to turn out efficiently a large number of articles which are entirely foreign to their regular lines. It will be a big job, but it can and will be done, and it must be commenced at once. If the importance of this step had been realized by England and Russia, the world would now be at peace. It was because Germany did realize the importance of this work and had organized its industries for national support, and because Germany knew that England and Russia had failed to do so, that Germany struck when she did. There are today in England 1,500,000 trained soldiers who are drilling without rifles. In Russia the number of unarmed soldiers is more than twice as great. In spite of the huge orders for rifles placed with our American manufacturers nearly two years ago, not a single one of these rifles has yet reached the front. The rifles are coming forward fast but they are not yet in use. It is no child's play to turn out such material in large quantities. A few days ago in the train a loud-voiced man just behind me informed his companion that the present Russian advance was only made possible by the enormous shipments of rifles from the United States. He might have felt less assurance if he had known the fact that the large shipments referred to came from Japan and not from this country.

The Industrial Inventory has already brought to light certain startling facts. We find that, thanks to foreign orders, within a few months our capacity in rifles and in shells for artillery may be classed as entirely satisfactory, but there are only three concerns in this country which are now capable of turning out the artillery itself, and the entire production of our manufacturers of rifle cartridges has been so small that it is merely used for target practice in Great Britain and Russia, the quantity not being sufficiently large to warrant shipments to the Front. Therefore, while we have rifles we have nothing to shoot in them, and while we have shells we have nothing to shoot them out of.

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This is one thing that we have learned in taking account of stock.

The practice in the present war indicates the much greater use of machine guns as an arm for infantry. At the beginning of the war the British were equipped with 400 machine guns. The Germans had 50,000. It is now predicted that in a regiment of 1,000 men there will be 50 machine guns. It is certain that in our Army there would need to be at least 5,000 of them. The best type of gun shoots 700 rifle cartridges per minute, therefore its theoretical consumption is 42,000 cartridges per hour, or 1,008,000 per 24 hours. We have five concerns in this country who make these cartridges. Only one of the five is able to turn out a million cartridges per day, or the theoretical consumption of one machine gun. While on account of various delays due to defective cartridges, the necessity for changing barrels and so forth, no machine gun can approach the maximum mentioned, yet when we consider the requirements of 5,000 machine guns, added to the consumption of the same cartridges in ordinary rifles, and compare the total figure with the combined capacity of all of our cartridge factories, we must admit that there exists a serious discrepancy.

This country is now making enormous shipments of powder and high explosives, but for their production we are dependent upon the importation of Chile nitrates; therefore the present activity and efficiency of the powder companies, while it is good business for them, means very little as a factor in our national safety, for if this country were now engaged in war these powder factories would be empty and idle, as their supply of raw material would have been cut off. Our security does not lie in the amount of war materials that we can turn out in time of peace, but upon what we could produce in time of war. The only remedy for this shortage of nitrates lies either in the purchase and maintenance of a large quantity of Chile nitrates or in the construction of the proposed plant which can produce from the air or from ammonia nitric acid for explosives in time of war and nitrates for fertilizer in time of peace. All the explosives now being used by Germany are made with nitric acid obtained from the air.

We have also learned from our investigations that the supplies regularly needed by our Army and Navy in time of peace will be amply sufficient to provide the educational orders that I have mentioned. Instead of buying as at present 100,000 pairs of uniform trousers from one concern, the Government will simply buy 100 pairs each from 1,000 concerns at about the same price. Then if the time comes when Uncle Sam really needs trousers, they will be forthcoming. The manufacturers of "college clothes," whose advertisements in the magazines show trousers of impossible beauty, will simply change their customers from the handsome young man with a walking stick to another young man with a rifle, and they will do it without loss of time or money or demoralization of their business.

With all our manufacturers once trained to give their full support to our armed forces, this country will have achieved an amount and degree of preparedness which no other country has ever known. We possess fully one half of all the industrial equipment in the world. When we have learned how to use it for national defense, we shall certainly be too strong to have to fight.

People don't play with a buzz-saw, and that's what this country when prepared would be—a buzz-saw, all oiled up with its teeth sharpened and a big sign, "Hands Off!", but ready, at the throw of a switch, to buzz.

## A Metal Socket Which Acts as a Hand in Driving a Car

(*Concluded from page 46*)

least, not with his former dexterity and temerity. His erstwhile right arm had served to manipulate the two levers at the side. But his problem was solved in a simple way; instead of providing a com-

plicated artificial hand, he has made use of a simple metal socket which is attached to the end of a framework and sleeve fitting over the stump. The socket can be quickly placed over the handle of either lever, and with a slight downward pressure the locking button is depressed to permit of its movement. When not engaged in shifting levers, this simple mechanical hand is used to help steer the car.

### An Illuminated Celluloid Hand for Automobile Signaling

(*Concluded from page 46*)

signaling is and how natural it is for one driver to watch the other, has invented an illuminated hand. This device allows the motorist to signal at night in the same way as he does so naturally and unconsciously during the day time. When he holds this signal out he feels sure the motorists following see his signal; and he himself can see that it is working.

As can be seen in the accompanying illustration, the device is made up of a blown celluloid hand which is fitted over a tubular battery lamp. This lamp, which is lighted only for an instant when signaling, has a special reflector which throws the rays of the lamp uniformly into the hand and illuminates it so that it can easily be seen for at least 300 feet. The hand may be removed and the device used as an emergency lamp on the road or in the garage, which makes it desirable to have in any motor car. One of the city officials has also proposed the use of the device by the traffic officers not only for downtown intersections but for those stations in parks during concerts or other celebrations when it becomes necessary to have an officer in charge of traffic. Because of its simplicity it is low in cost, and there is no time or expense required in the installation.

## NEW BOOKS, ETC.

THE FIRST YEAR OF SCIENCE. By John C. Hessler, Ph. D. New York: Benj. H. Sanborn & Co., 1915. 8vo.; 615 pp.; illustrated.

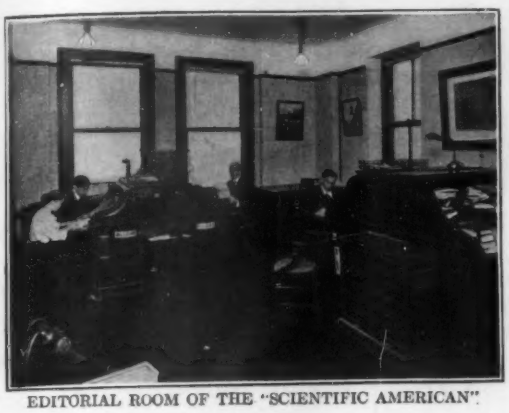
This course is designed to meet the need of general science instruction, and includes the text proper, the laboratory manual, and the teacher's handbook, the first two of these being obtainable either under one binding or separately. The aim is to stimulate "uncommon thinking about common things," to develop the scientific attitude toward the problems of every-day life, and to make modern inventions the tools, and not merely the toys, of the people who use them. Well-placed exercises and summaries encourage the intelligent application of principles and furnish reviews that cannot but impress the teaching of the lessons upon the mind.

WIRELESS TRANSMISSION OF PHOTOGRAPHS. By Marcus J. Martin. New York: Marconi Publishing Corpn., 1916. 8vo.; 128 pp.; illustrated. Price, $1 net.

Systems for the wireless transmission of photographs are yet in a purely experimental stage, but the author has such faith in the promise of this art that he believes a work embodying its problems and the methods pursued toward their solution to be timely and serviceable. His monograph describes and compares the various makes of transmitting and receiving apparatus, and discusses synchronizing and driving, selenium cells and their characteristics, and the preparation of the metal prints. Among the many excellent illustrations are plates showing the author's own experimental machine. Wireless operators interested in this branch of the science, and having some elementary knowledge of optics, chemistry, and mechanics, will find that the work puts them in touch with recent developments and will enable them to pursue some interesting investigations on their own account.

LABORATORY PROBLEMS IN CIVIC BIOLOGY. By George William Hunter, A.M. New York: American Book Company. 8vo.; 283 pp.; illustrated. Price, 80 cents net.

In this biological course for beginners in the secondary school, the laboratory problems, which are intended to precede the textbook work, are brought together in a separate volume. The course keeps clearly in view the value of observational training, and the acquirement of ability to reason from accurate observations to correct conclusions. The "inductive search for the unknown" is placed in its most alluring light, taking as a starting point some definite concrete experience within the pupil's own field of vision; the true spirit of investigation is thus fostered. The greatest stress is laid upon the human body and its functions, and the control and improvement of environing conditions. The course skilfully imparts a knowledge of the more important biological concepts on which society rests, and inspires the pupil to become a better citizen.



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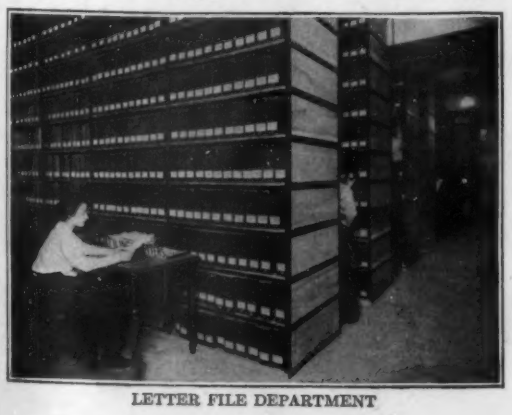

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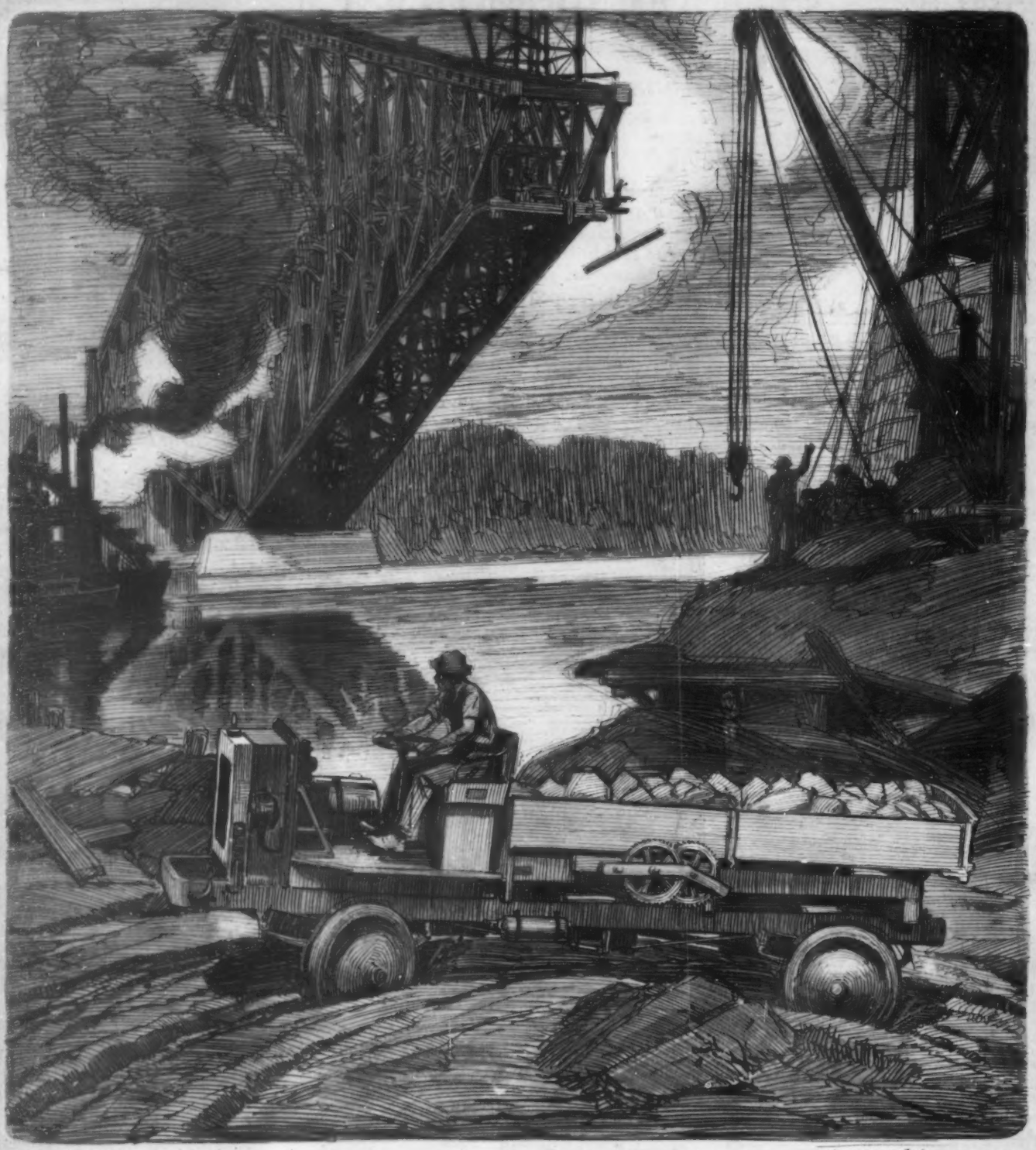

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